# 5 CHAPTER COST OF CAPITAL

**Q.1** Effective Cost of Capital | MTP May 19(2)

Annova Ltd is considering raising funds of about Rs.250 lakhs by any of two alternative methods, viz., 14% institutional term loan and 13% non-convertible debentures. The term loan option would attract no major incidental cost and can be ignored. The debentures would have to be issued at a discount of 2.5% and would involve cost of issue of 2% on face value.

ADVISE the company as to the better option based on the effective cost of capital in each case. Assume a tax rate of 50%.

**Ans.** Calculation of Effective Cost of Capital:

| Particulars | Option 1 14% institutional Term loan (Rs. in Lakhs) | Option 2 13% Non-convertible Debentures (Rs. in lakhs) |
|---|---|---|
| (A) Effective capital to be raised Face value | 250.00 | 250.00 |
| Less: Discount | Nil | (6.25) |
| | 250.00 | 243.75 |
| *Less:* Cost of issue | Nil | 5.00 |
| Effective amount of capital | 250.00 | 238.75 |
| (B) Annual interest charges on face value of Rs. 250 lakhs | 35.0 | 32.50 |
| *Less:* Tax benefit on interest @ 50% | 17.5 | 16.25 |
| | 17.5 | 16.25 |
| (C) Effective cost of capital after tax | $\frac{B}{A} \times 100$ = 7.0% | $\frac{16.25}{238.75} \times 100$ = 6.81% (approx) |

So, the better option is raising of funds of Rs.250 lakhs by issue of 13% Non-convertible Debenture

**Q.2** Implied Rate of Return | MTP May 22(1)

PRI Ltd. and SHA Ltd. are identical, however, their capital structure (in market-value terms) differs as follows:

| Company | Debt | Equity |
|---|---|---|
| PRI Ltd. | 60% | 40% |
| SHA Ltd. | 20% | 80% |

The borrowing rate for both companies is 8% in a no-tax world and capital markets are assumed to be perfect.

**(a)** (i) If Mr. Rhi, owns 6% of the equity shares of PRI Ltd., DETERMINE his return if the Company has net operating income of ₹ 9,00,000 and the overall capitalization rate of the company (Ko) is 18%.

(ii) CALCULATE the implied required rate of return on equity of PRI Ltd.

**(b)** SHA Ltd. has the same net operating income as PRI Ltd.

(i) CALCULATE the implied required equity return of SHA Ltd.

(ii) ANALYSE why does it differ from that of PRI Ltd.

**Ans.** Value of PRI Ltd. = NOI 9,00,000= 50,00,000

Ko 18%

**(a) (i) Return on Shares of Mr. Rhi on PRI Ltd.**

| **Particulars** | **Amount (₹)** |
|---|---|
| Value of the company | 50,00,000 |
| Market value of debt (60% x ₹ 50,00,000) | 30,00,000 |
| Market value of shares (40% x ₹ 50,00,000) | **20,00,000** |
| **Particulars** | **Amount (₹)** |
| Net operating income | 9,00,000 |
| Interest on debt (8% × ₹ 30,00,000) | 2,40,000 |
| Earnings available to shareholders | **6,60,000** |
| Return on 6% shares (6% × ₹ 6,60,000) | **39,600** |

**(ii)** Implied required rate of return on equity of PRI Ltd. = $\frac{660000}{2000000}$ =33%

**(b) (i) Calculation of Implied rate of return of SHA Ltd.**

| **Particulars** | **Amount (₹)** |
|---|---|
| Total value of company | 50,00,000 |
| Market value of debt (20% × ₹ 50,00,000) | 10,00,000 |
| Market value of equity (80% × ₹ 50,00,000) | 40,00,000 |
| **Particulars** | **Amount (₹)** |
| Net operating income | 9,00,000 |
| Interest on debt (8% × ₹ 10,00,000) | 80,000 |
| Earnings available to shareholders | 8,20,000 |

Implied required rate of return on equity = $\frac{820000}{4000000}$ = 20.5%

**(ii)** Implied required rate of return on equity of SHA Ltd. is lower than that of PRI Ltd. because SHA Ltd. uses less debt in its capital structure. As the equity capitalisation is a linear function of the debt-to-equity ratio when we use the net operating income approach, the decline in required equity return offsets exactly the disadvantage of not employing so much in the way of "cheaper" debt funds.

**Q.3** Cost of Debt (Kd) | RTP Nov 22

Bounce Ltd. evaluates all its capital projects using discounting rate of 15%. Its capital structure consists of equity share capital, retained earnings, bank term loan and debentures redeemable at par. Rate of interest on bank term loan is 1.5 times that of debenture. Remaining tenure of debenture and bank loan is 3 years and 5

years respectively. Book value of equity share capital, retained earnings and bank loan is ₹ 10,00,000, ₹ 15,00,000 and ₹ 10,00,000 respectively. Debentures which are having book value of ₹ 15,00,000 are currently trading at ₹ 97 per debenture. The ongoing P/E multiple for the shares of the company stands at 5. You are required to CALCULATE the rate of interest on bank loan and debentures if tax rate applicable is 25%.

**Ans.** Let the rate of Interest on debenture be x

$\therefore$ Rate of Interest on loan = 1.5x

$$\therefore \text{Kd on debentures} = \frac{Int(1-t)+\frac{RV-NP}{n}}{\frac{RV+NP}{2}} = \frac{100x(1-25)+\frac{100-97}{3}}{\frac{100+97}{2}} = \frac{75x+1}{98.5}$$

$\therefore$ Kd on bank loan= 1.5x (1-0.25) =1.125x

$$Ke = \frac{FPS}{MPS} = \frac{1}{MPS/EPS} = \frac{1}{P/E} = \frac{1}{5} = 0.2$$

KY = Ke = 0.2

**Computation of WACC**

| Capital | Amount (₹) | Weights | Cost | Product |
|---|---|---|---|---|
| Equity | 10,00,000 | 0.2 | 0.2 | 0.04 |
| Reserves | 15,00,000 | 0.3 | 0.2 | 0.06 |
| Debentures | 15,00,000 | 0.3 | (75x+1)/98.5 | (22.5x + 0.3)/98.5 |
| Bank Loan | 10,00,000 | 0.2 | 1.125x | 0.225x |
| | 50,00,000 | 1 | | 0.1 + 0.225x + 22.5x +0.3 |
| | | | | 98.5 |

WACC = 15%

$$\therefore 0.1+0.225x+\frac{22.5x}{98.5}+\frac{0.3}{98.5}=0.15$$

$\therefore$ 9.85+22.1625x+22.5x+0.3=(0.15)(98.5)

$\therefore$ 44.6625x=14.775-9.85-0.3

$\therefore$ 44.625x-4.625

$$\therefore x = \frac{4.625}{44.6625}$$

$\therefore$ x=10.36%

$\therefore$ Rate of interest on debenture=x =10.36%

Rate of interest on Bank loan=1.5x = (1.5) (10.36%) = 15.54%

**Q. 4** Cost of Debt (Kd) | PY Nov 20

TT Ltd. issued 20,000, 10% convertible debenture of ₹ 100 each with a maturity period of 5 years. At maturity the debenture holders will have the option to convert debentures into equity shares of the company in ratio of 1:5 (5 shares for each debenture). The current market price of the equity share is ₹ 20 each and historically the growth rate of the share is 4% per annum. Assuming tax rate is 25%. Compute the cost of 10% convertible debenture using Approximation Method and Internal Rate of Return Method.PV Factor are as under:

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | | | | | |
| PV Factor @ 15% | 0.870 | 0.756 | 0.658 | 0.572 | 0.497 |

**Ans.**

**Determination of Redemption value:**

Higher of-

(i) The cash value of debentures = ₹100

(ii) Value of equity shares = 5 shares × ₹ 20 $(1+0.04)^5$

= 5 shares × ₹ 24.333

= **₹121.665 rounded to ₹121.67**

₹121.67 will be taken as redemption value as it is higher than the cash option and attractive to the investors.

**Calculation of Cost of 10% Convertible debenture**

**(i) Using Approximation Method:**

$$K_{d=}\frac{I(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}}=\frac{10(1-0.25)+(121.67-100)}{\frac{5}{(121.67+100)}}=\frac{7.5+4.334}{110.835}=10.676\%$$

**(ii) Using Internal Rate of Return Method**

| Year | Cash flows (₹) | Discount factor @ 10% | Present Value | Discount factor @ 15% | Present Value (₹) |
|---|---|---|---|---|---|
| 0 | 100 | 1.000 | (100.00) | 1.000 | (100.00) |
| 1 to 5 | 7.5 | 3.790 | 28.425 | 3.353 | 25.148 |
| 5 | 121.67 | 0.621 | 75.557 | 0.497 | 60.470 |
| NPV | | | **+3.982** | | - |

$$IRR=L+\frac{NPV_L}{NPV_L-NPV_L}(H-L)=10\%+\frac{3.982}{3.982-(-14.382)}(15\%-10\%)$$

=0.11084 or 11.084% (approx.)

**Q.5** Cost of Debt / Equity / WACC | RTP May 18

Navya Limited wishes to raise additional capital of ₹10 lakhs for meeting its modernisation plan. It has ₹ 3,00,000 in the form of retained earnings available for investments purposes. The following are the further details:

| | |
|---|---|
| Debt/ equity mix | 40%/60% |
| Cost of debt (before tax) | |
| Upto ₹ 1,80,000 | 10% |
| Beyond ₹ 1,80,000 | 16% |
| Earnings per share | ₹ 4 |
| Dividend pay out | ₹ 2 |
| Expected growth rate in dividend | 10% |

| | |
|---|---|
| Current market price per share | ₹ 44 |
| Tax rate | 50% |

Required:

(i) To DETERMINE the pattern for raising the additional finance.

(ii) To CALCULATE the post-tax average cost of additional debt.

(iii) To CALCULATE the cost of retained earnings and cost of equity, and

(iv) To DETERMINE the overall weighted average cost of capital (after tax).

**Ans.**

(i) **Pattern of Raising Additional Finance**

Equity = 10,00,000 × 60/100 = ₹ 6,00,000

Debt = 10,00,000 × 40/100 = ₹ 4,00,000

Capital structure after Raising Additional Finance

| Sources of fund | Amount(₹) |
|---|---|
| Shareholder's funds | |
| Equity capital (6,00,000 – 3,00,000) | 3,00,000 |
| Retained earnings | 3,00,000 |
| Debt at 10% p.a. | 1,80,000 |
| Debt at 16% p.a. (4,00,000 –1,80,000) | 2,20,000 |
| Total funds | 10,00,000 |

(ii) **Post-tax Average Cost of Additional Debt**

Kd=I(1-t), where 'Kd' is cost of debt, 'I' is interest and 't' is tax rate.

On '1,80,000=10%(1-0.5)=5% or 0.05

On '2,20,000=16% (1-0.5)=8% or 0.08

Average Cost of Debt (Post tax) i.e.

$$Kd= \frac{(1,80,000x0.05)+(2,20,000x0.08)}{4,00,000} x100 = 6.65\%$$

(iii) **Cost of Retained Earnings and Cost of Equity applying Dividend Growth Model**

$$Ke= \frac{D_1}{P_o} + a \text{ or } \frac{D(1+g)+g}{1}$$

$$\text{Then, } Ke= \frac{2(1.1)}{4} + 0.10 = \frac{2.2}{44} + 0.10 = 0.15 \text{ or } 15\%$$

(iv) **Overall Weighted Average Cost of Capital (WACC) (After Tax)**

| Particulars | Amount (₹) | Weights | Cost of Capital | WACC |
|---|---|---|---|---|
| Equity (including retained earnings) | 6,00,000 | 0.60 | 15% | 9.00 |
| Debt | 4,00,000 | 0.40 | 6.65% | 2.66 |
| Total | 10,00,000 | 1.00 | | 11.66 |

**Q.6** Cost of Debt / Equity / Marginal | RTP Jul 21

Indel Ltd. has the following capital structure, which is considered to be optimum as on 31st March, 2021:

| Particulars | (₹) |
|---|---|
| 14% Debentures | 60,000 |
| 11% Preference shares | 20,000 |
| Equity Shares (10,000 shares) | 3,20,000 |
| | 4,00,00 |

The company share has a market price of ₹ 47.20. Next year dividend per share is 50% of year 2020 EPS. The following is the uniform trend of EPS for the preceding 10 years which is expected to continue in future.

| Year | EPS (₹) | Year | EPS (₹) |
|---|---|---|---|
| 2011 | 2.00 | 2016 | 3.22 |
| 2012 | 2.20 | 2017 | 3.54 |
| 2013 | 2.42 | 2018 | 3.90 |
| 2014 | 2.66 | 2019 | 4.29 |
| 2015 | 2.93 | 2020 | 4.72 |

The company issued new debentures carrying 16% rate of interest and the current market price of debenture is ₹ 96. Preference shares of ₹ 18.50 (with annual dividend of ₹ 2.22 per share) were also issued. The company is in 30% tax bracket.

The company is in 30% tax bracket.

(A) CALCULATE after tax:
  (i) Cost of new debt
  (ii) Cost of new preference shares
  (iii) New equity share (assuming new equity from retained earnings)

(B) CALCULATE marginal cost of capital when no new shares are issued.

(C) DETERMINE the amount that can be spent for capital investment before new ordinary shares must be sold, assuming that the retained earnings for next year's investment is 50 percent of earnings of 2020.

(D) COMPUTE marginal cost of capital when the fund exceeds the amount calculated in assuming new equity is issued at ₹ 40 per share?

**Ans.** (A) (i) **Cost of new debt**

$$K_d = \frac{I(1-t)}{P_0} \qquad = \frac{16(1-0.3)}{96} = 0.11667$$

(ii) **Cost of new preference shares**

$$K_p = \frac{2.22}{18.5} = 0.12$$

(iii) **Cost of new equity shares**

$$K_e = \frac{D_1}{P_0} + g \qquad = \frac{2.36}{47.20} + 0.10$$

$K_e$ = 0.05 + 0.10 = 0.15

**Calculation of g when there is a uniform trend (on the basis of EPS)**

$$\frac{EPS(2012) - EPS(2011)}{EPS(2011)} = \frac{2.20 - 2.00}{2.00} = 0.10 \text{ or } 10\%$$

**Calculation of D1**

D1 = 50% of 2020 EPS = 50% of ₹ 4.72 = ₹ 2.36

(B) **Calculation of marginal cost of capital**

| Type of Capital | Proportion | Specific Cost | Product |
|---|---|---|---|
| (1) | (2) | (3) | (2) × (3) = (4) |
| Debentures | 0.15 | 0.11667 | 0.0175 |
| Preference Share | 0.05 | 0.1200 | 0.0060 |
| Equity Share | 0.80 | 0.1500 | 0.1200 |
| Marginal cost of capital | | | 0.1435 |

(C) **The company can spend the following amount without increasing marginal cost of capital and without selling the new shares:**

Retained earnings = 50% of EPS of 2020 × outstanding equity shares

= 50% of ₹ 4.72 × 10,000 shares = ₹ 23,600

The ordinary equity (Retained earnings in this case) is 80% of total capital

So, ₹ 23,600 = 80% of Total Capital

(D) If the company spends in excess of ₹ 29,500, it will have to issue new equity shares at ₹ 40 per share.

∴ The cost of new issue of equity shares will be:

$$K_e = \frac{D_1}{P_0} + g = \frac{`2.36}{`40} + 0.10 = 0.159$$

The marginal cost of capital will be:

| Type of Capital | Proportion | Specific Cost | Product |
|---|---|---|---|
| (1) | (2) | (3) | (2) × (3) = |
| Debentures | 0.15 | 0.11667 | 0.0175 |
| Preference Shares | 0.05 | 0.1200 | 0.0060 |
| Equity Shares (New) | 0.80 | 0.1590 | 0.1272 |
| Marginal cost of | | | 0.1507 |

**Q.7** Cost of Debt / Preference | PY May 22

**A company issues:**

- 15% convertible debentures of ₹ 100 each at par with a maturity period of 6 years. On maturity, each debenture will be converted into 2 equity shares of the company. The risk - free rate of return is 10%, market risk premium is 18% and beta of the company is 1.25. The company has paid dividend of ₹ 12.76 per share. Five year ago, it paid dividend of 10 per share. Flotation cost is 5% of issue amount.
- 5% preference shares of ₹ 100 each at premium of 10%. These shares are redeemable after 10 years at par. Flotation cost is 6% of issue amount.

**Assuming corporate tax rate is 40%.**

(i) Calculate the cost of convertible debentures using the approximation method.

(ii) Use YTM method to calculate cost of preference shares.

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| PVIF 0.03, | 0.97 | 0.94 | 0.91 | 0.88 | 0.86 | 0.83 | 0.81 | 0.78 | 0.76 | 0.74 |
| PVIF 0.05, | 0.95 | 0.90 | 0.86 | 0.82 | 0.78 | 0.74 | 0.711 | 0.67 | 0.64 | 0.61 |
| PVIFA | 0.97 | 1.913 | 2.82 | 3.71 | 4.58 | 5.41 | 6.23 | 7.02 | 7.78 | 8.53 |
| PVIFA | 0.95 | 1.85 | 2.72 | 3.54 | 4.32 | 5.07 | 5.78 | 6.46 | 7.10 | 7.72 |

| Interest rate | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% |
|---|---|---|---|---|---|---|---|---|---|
| FVIF i, 5 | 1.051 | 1.104 | 1.159 | 1.217 | 1.27 | 1.33 | 1.40 | 1.46 | 1.53 |
| FVIF i, 6 | 1.06 | 1.126 | 1.194 | 1.26 | 1.34 | 1.419 | 1.501 | 1.58 | 1.67 |
| FVIF i, 7 | 1.07 | 1.149 | 1.23 | 1.316 | 1.40 | 1.50 | 1.60 | 1.714 | 1.82 |

**Ans.** (i) **Calculation of Cost of Convertible Debentures:**

Given that,

$R_F$ = 10% $R_m - R_t$ = 18%

B = 1.25% $D_0$ = 12.76

$D_{-5}$ = 10 Flotation Cost = 5%

Using CAPM,

$K_e$ = $R_t + \beta(R_m - R_f)$ = 10%+1.25(18%)

= 32.50%

Calculation of growth rate in dividend

$12.76 = 10\ (1+g)^5$

$1.276 = (1+g)^5$

(1+5%) = 1.276..... from FV Table

g = 5%

Price of share after 6 years = $\frac{D_7}{k_{e-g}} = \frac{12.76(1.05)^7}{0.325 - 0.5}$

P6 = $\frac{12.75x1.407}{0.275}$ = 65.28

Redemption Value of Debenture (RV) = 65.28 × 2 = 130.56 (RV)

NP = 95 n = 6

$K_d = \frac{INT(1-t) + \frac{(RV - NP)}{n}}{\frac{[RV - NP]}{2}} X100 = \frac{9 + 5.93}{112.78} X100$

$K_d$ = 13.24%

(ii) **Calculation of Cost of Preference Shares:**

Net Proceeds = 100(1.1)-6% of 100 (1.1)
= 110-6.60
= **103.40**
Redemption Value = 100

| Year | Cash Flows (₹) | PVF @ 3% | PV (₹) | PVF @ 5% | PV (₹) |
|---|---|---|---|---|---|
| 0 | 103.40 | 1 | 103.40 | 1 | 103.40 |
| 1-10 | -5 | 8.530 | -42.65 | 7.722 | -38.61 |
| 10 | -100 | 0.744 | -74.40 | 0.614 | -61.40 |
| | | | - | | **3.39** |

$$K_p = 3\% + \frac{5\% - 3\%}{[3.39 - (-13.65)]} x 13.65 = 4.6\%$$

**Q.8** Cost of Debt / Equity / WACC | PY Nov 19

A Company wants to raise additional finance of ₹ 5 crore in the next year. The company expects to retain ₹ 1crore earning next year. Further details are as follows:

(i) The amount will be raised by equity and debt in the ratio of 3: 1.

(ii) The additional issue of equity shares will result in price per share being fixed at ₹ 25.

(iii) The debt capital raised by way of term loan will cost 10% for the first ₹ 75 lakh and 12% for the next ₹50 lakh.

(iv) The net expected dividend on equity shares is ₹ 2.00 per share. The dividend is expected to grow at the rate of 5%.

(v) Income tax rate is 25%.

**You are required:**

(a) To determine the amount of equity and debt for raising additional finance.

(b) To determine the post-tax average cost of additional debt.

(c) To determine the cost of retained earnings and cost of equity.

(d) To compute the overall weighted average cost of additional finance after tax .

**Ans**

(a) **Determination of the amount of equity and debt for raising additional finance:**

Pattern of raising additional finance
Equity 3/4 of ₹ 5 Crore = ₹ 3.75 Crore
Debt 1/4 of ₹ 5 Crore = ₹ 1.25 Crore

The capital structure after raising additional finance:

| Particulars | | (₹ Incrore) |
|---|---|---|
| **Shareholders' Funds** | | |
| Equity Capital | (3.75 - 1.00) | 2.75 |

| | | |
|---|---|---|
| Retained earnings | | 1.00 |
| Debt (Interest at 10% p.a.) | | 0.75 |
| (Interest at 12% p.a.) | (1.25-0.75) | 0.50 |
| Total Funds | | 5.00 |

(b) **Determination of post-tax average cost of additional debt**

$K_d = I(1-t)$

Where,

I= Interest Rate

t = Corporate tax-rate

On ₹ 75,00,000= 10% (1 – 0.25) = 7.5% or 0.075

On ₹ 50,00,000= 12% (1 – 0.25) = 9% or 0.09

**Average Cost of Debt**

$$= \frac{(75,00,000 x 0.75) + (50,00,000 x 0.09)}{1,25,00,000} x100$$

$$= \frac{5,62,500 + 4,50,000}{1,25,00,000} x100 = 8.10\%$$

**(c) Determination of cost of retained earnings and cost of equity (Applying Dividend growth model):**

$$K_e = \frac{D_1}{P_0} + g$$

Where,

$K_e$= Cost of equity

$D_1 = D_0(1+g)$

$D_0$= Dividend paid (ie= Rs2)

g = Growth rate

$P_0$= Current market price per share

Then, $K_e = \frac{2(1.05)}{25} + 0.05 = \frac{2.1}{25} + 0.05 = 0.084 + 0.05 = 0.134 = 13.4\%$

Cost of retained earnings equals to cost of Equity i.e. 13.4%

**(d) Computation of overall weighted average after tax cost of additional finance**

| Particular | (₹) | Weights | Cost of funds | Weighted Cost (%) |
|---|---|---|---|---|
| Equity (including retained earnings) | 3,75,00,000 | 3/4 | 13.4% | 10.05 |
| Debt | 1,25,00,000 | 1/4 | 8.1% | 2.025 |
| WACC | 5,00,00,000 | | | **12.075** |

**Q.9** Cost of Debt / Equity | MTP Nov 23(1)

ABC Company's equity share is quoted in the market at ₹ 30 per share currently. The company pays a dividend of ₹ 3 per share and the investor's market expects a growth rate of 7% per year.

**You are required to:**

(i) CALCULATE the company's cost of equity capital.

(ii) If the company issues 10% debentures of face value of ₹ 100 each and realises ₹ 95 per debenture while the debentures are redeemable after 10 years at a premium of 10%, CALCULATE cost of debenture using YTM?

Assume Tax Rate to be 50%.

**Ans.** (i) **Cost of Equity Capital (Ke):**

$$K_e = \frac{Expected\ dividend\ per\ share(D_1)}{Market\ price\ per\ share(P_0)} + Growth\ rate(g)$$

$$= \frac{3x1.07}{30} + 0.07 = 0.177 \text{ or } 17.7\%$$

(ii) **Cost of Debenture (Kd):**

Using Present Value method (YTM)

Identification of relevant cash flows

| Year | Cash flows |
|---|---|
| 0 | Current market price (P0) = ₹ 95 |
| 1 to 10 | Interest net of tax [I(1-t)] = 10% of ₹ 100 (1 – 0.5) = ₹ 5 |

Calculation of Net Present Values (NPV) at two discount rates

| Year | Cash flows | Discount factor @ 5% (L) | Present Value (₹) | Discount factor @ 10% (H) | Present Value (₹) |
|---|---|---|---|---|---|
| 0 | (95) | 1.000 | (95.00) | 1.000 | (95.00) |
| 1 to 10 | 5 | 7.722 | 38.61 | 6.145 | 30.725 |
| 10 | 110 | 0.614 | 67.54 | 0.386 | 42.46 |
| NPV | | | +11.15 | | -21.815 |

Calculation of IRR

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H - L)$$

$$5\% + \frac{`11.15}{`11.15 - (`-21.815)}(10\% - 5\%) = 5\% + \frac{`55.75}{`32.965} = 6.69\%$$

Therefore, $K_d$= 6.69%

**Q.10** Cost of Equity | MTP May 22(1)

**Following information is given for WN Ltd.:**

| | |
|---|---|
| Earnings | Rs 30 per share |
| Dividend | Rs 9 per share |
| Cost of capital | 15% |
| Internal Rate of Return on investment | 20% |

You are required to CALCULATE the market price per share using-

(i) Gordon's formula

(ii) Walter's formula

**Ans.** (i) **As per Gordon's Model, Price per share is computed using the formula:**

$$P_0 = \frac{E_{1(1-b)}}{K_{e-br}}$$

Where,

$P_0$= Price per share

E1 = Earnings per share

b = Retention ratio; (1-b= Pay-out ratio)

$K_e$= Cost of capital

r = IRR

br = Growth rate (g)

Applying the above formula, price per share

$$P_0 = \frac{30x0.3^*}{0.15 - 0.70x0.2} = \frac{9}{0.01} = ₹900$$

*Dividend pay-out ratio $= \frac{9}{30} = 0.3$ or 0.3

(ii) **As per Walter's Model, Price per share is computed using the formula:**

$$\text{Price (P)} = \frac{D + \frac{r}{Ke}(E - D)}{\frac{k}{e}}$$

Where,

P = Market Price of the share
E = Earnings per share
D = Dividend per share
$K_e$= Cost of equity/ rate of capitalization/ discount rate
r = Internal rate of return/ return on investment

Applying the above formula, price per share

$$P = \frac{9 + \frac{0.20}{0.15}(30 - 9)}{0.15} = \frac{37}{0.15} = 246.67$$

**Q.11** Cost of Debt / Equity | MTP Dec 21(2)

XYZ Company's equity share is quoted in the market at ₹ 25 per share currently. The company pays a dividend of ₹ 5 per share and the investor's market expects a growth rate of 5% per year.

You are required to:

(i) CALCULATE the company's cost of equity capital.

(ii) If the company issues 12% debentures of face value of ₹ 100 each and realises ₹ 95 per debenture while the debentures are redeemable after 10 years at a premium of 12%, CALCULATE cost of debenture using YTM?

**Ans.** (i) **Cost of Equity Capital (Ke):**

$$K_e = \frac{Expected\ dividend\ per\ share(D_{1})}{Market price per share(P_{0})} + Growth rate(g)$$

$$= \frac{5 \times 1.05}{25} + 0.05 = 26\%$$

(iii) **Cost of Debenture (Kd):** Using Present Value method (or YTM)

Identification of relevant cash flows

| Year | Cash flows |
|---|---|
| 0 | Current market price (P0) = ₹ 95 |
| 1 to 10 | Interest net of tax [I(1-t)] = 12% of ₹ 100 (1 – 0.30) = ₹ 8.40 |
| 10 | Redemption value (RV) = ₹ 100 (1.12) = ₹ 112 |

Calculation of Net Present Values (NPV) at two discount rates

| Year | Cash flows | Discount factor @ 9% (L) | Present Value | Discount factor @ 10% (H) | Present Value |
|---|---|---|---|---|---|
| 0 | (95) | 1.0000 | (95.00) | 1.0000 | (95.00) |
| 1 to 10 | 8.40 | 6.4176 | 53.91 | 6.1445 | 51.61 |
| 10 | 112 | 0.4224 | 47.31 | 0.3855 | 43.18 |
| NPV | | | +6.22 | | -0.21 |

**Calculation of IRR**

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H - L)$$

$$9\% + \frac{6.22}{6.22 - (-0.21)}(10\% - 9\%) = 9\% + \frac{6.22}{6.43} = 9.97\%$$

Therefore, $K_d$ = 9.97%

**Q.12** Cost of Debt / Equity | MTP May 21(2)

In March 2021 Tiruv Ltd.'s share was sold for Rs. 219 per share. A long-term earnings growth rate of 11.25% is anticipated. Tiruv Ltd. is expected to pay a dividend of Rs. 5.04 per share.

(i) DETERMINE the rate of return an investor can expect to earn assuming that dividends are expected to grow along with earnings at 11.25% per year in perpetuity?

(ii) It is expected that Tiruv Ltd. will earn about 15% on book equity and shall retain 60% of earnings. In this case, whether there would be any change in growth rate and cost of equity? ANALYSE.

**Ans.**

**(i) According to Dividend Discount Model approach the firm's expected or required return on equity is computed as follows:**

$$K_e = \frac{D_1}{P_0} + g$$

Where,

$K_e$ = Cost of equity share capital

$D_1$ = Expected dividend at the end of year 1

$P_0$ = Current market price of the share.

$g$ = Expected growth rate of dividend.

Therefore, $K_e = \frac{5.04}{219} + 0.1125 = 13.55\%$

(ii) **With rate of return on retained earnings (r) of 15% and retention ratio (b) of 60%, new growth rate will be as follows:**

$g = br = 0.60 \times 0.15 = 0.09$ or 9%

Accordingly, dividend will also get changed and to calculate this, first we shall calculate previous retention ratio (b1) and then EPS assuming that rate of return on retained earning (r) is same.

With previous Growth Rate of 11.25% and r =15%, the retention ratio comes out to be:

$0.1125 = b1 \times 0.15$

b1= 0.75 and payout ratio = 0.25

With 0.25 payout ratio, the EPS will be as follows:

$EPS = \frac{5.04}{0.25} = Rs\ 20.16$

With new payout ratio of 40% (1 – 0.60) the new dividend will be:

$D_1$= Rs 20.16 x 0.40 = Rs. 8.064

Accordingly new $K_e$ will be:

$K_e = \frac{8.064}{219} + 0.09 = 12.68\%$

**Q.13** Cost of Equity/ Marginal | PY Nov 22

MR Ltd. is having the following capital structure, which is considered to be optimum as on 31.03.2022.

| | |
|---|---|
| Equity share capital (50,000 shares) | ₹ 8,00,000 |
| 12% Pref. share capital | ₹ 50,000 |
| 15% Debentures | ₹ 1,50,000 |
| | ₹ 10,00,000 |

The earnings per share (EPS) of the company were ₹ 2.50 in 2021 and the expected growth in equity dividend is 10% per year. The next year's dividend per share (DPS) is 50% of EPS of the year 202I. The current market price per share (MPS) is ₹ 25.00. The 15% new debentures can be issued by the company. The company's debentures are currently selling at ₹ 96 per debenture. The new 12% Pref. share can be sold at a net price of ₹ 91.50 (face value ₹ 100 each). The applicable tax rate is 30%.

You are required to calculate

(a) After tax cost of

(i) New debt,

(ii) New pref. share capital and

(iii) Equity shares assuming that new equity shares come from retained earnings. (b) Marginal cost of capital, How much can be spent for capital investment before sale of new equity shares assuming that retained earnings for next year investment is 50% of 2021?

**Ans**

(a) (i) **After tax cost of new Debt:**

$$K_d = \frac{I(1-t)}{P_1} = \frac{15(1-0.3)}{96}$$

$$= 0.1094 \text{ (or) } 10.94\%$$

(ii) **After tax cost of New Preference share capital:**

$$K_p = \frac{P_D}{P_0} = \left(\frac{12}{91.5}\right) = 0.1311 \text{ (or) } 13.11\%$$

(iii) **After tax cost of Equity shares:**

$$K_e = \left(\frac{D_1}{p_0}\right) + g = \left[\frac{(2.50x50\%)}{25}\right] + 0.10$$

$$=0.15 \text{ (or) } 15\%$$

(b) **Marginal Cost of Capital**

| Type of capital | Proportions | Specific cost | Product |
|---|---|---|---|
| Equity Shares | 0.80 | 0.15 | 0.12 |
| Preference Shares | 0.05 | 0.1311 | 0.0066 |
| Debentures | 0.15 | 0.1094 | 0.0164 |
| Marginal cost of capital | | | **0.1430** |

(c) **Amount that can be spend for capital investment**

Retained earnings = 50% of EPS x No. of outstanding Equity shares

= 1.25 x 50,000

Proportion of equity (Retained earnings here) capital is 80% of total capital. Therefore, ₹ 62,500 is 80% of total capital.

$$\therefore \text{ Amount of Capital Investment} = \frac{62,500}{0.80} = ₹78,125$$

**Q.14** Cost of Equity/ Debt/ WACC | PY July 21

Following are the information of TT Ltd.:

| *Particulars* | |
|---|---|
| *Earnings per share* | *₹ 10* |
| *Dividend per share* | *₹ 6* |
| *Expected growth rate in Dividend* | *6%* |
| *Current market price per share* | *₹ 120* |
| *Tax Rate* | *30%* |
| *Requirement of Additional Finance* | *₹ 30 lakhs* |
| *Debt Equity Ratio (For additional finance)* | *2:1* |
| *Cost of Debt* | |
| *0-5,00,000* | 10% |
| *5,00,001 - 10,00,000* | 9% |
| *Above 10,00,000* | 8% |

Assuming that there is no Reserve and Surplus available in TT Ltd.

You are required to:

(a) Find the pattern of finance for additional requirement

(b) Calculate post tax average cost of additional debt

(c) Calculate cost of equity

(d) Calculate the overall weighted average after tax cost of additional finance.

**Ans.**

(a) **Pattern of raising additional finance**

Equity 1/3 of ₹ 30,00,000 = ₹ 10,00,000

Debt 2/3 of ₹ 30,00,000 = ₹ 20,00,000

The capital structure after raising additional finance:

| **Particulars** | **(₹)** |
|---|---|
| **Shareholder's Funds** | |
| Equity Capital | 10,00,000 |
| Debt (Interest at 10% p.a.) | 5,00,000 |
| (Interest at 9% p.a.) | 5,00,000 |
| (Interest at 8% p.a.) | 10,00,000 |
| **Total Funds** | **30,00,00** |

(b) **Determination of post-tax average cost of additional debt**

$K_d = I(1-t)$

Where, I = Interest Rate

t = Corporate tax-rate

On First ₹ 5,00,000 = 10% (1 – 0.3) = 7% or 0.07

On Next ₹ 5,00,000 = 9% (1 – 0.3) = 6.3% or 0.063

On Next ₹ 10,00,000 = 8% (1 – 0.3) = 5.6% or 0.056

$$\text{Average Cost of Debt} = \frac{(5,00,000x0.07)+(5,00,000x0.63)+(10,00,000x0.056)}{20,00,000} x100 = 6.125\%$$

(c) **Determination of cost of equity applying Dividend growth model:**

$$K_e = \frac{D_1}{P_0} + g$$

Where,

$K_e$ = Cost of equity

$D_1$ = D0 (1+ g)

$D_0$ = Dividend paid

g = Growth rate = 6%

$P_0$ = Current market price per share = ₹ 120

$$K_e = \frac{6(1+0.06)}{120} + 0.06 = \frac{6.36}{120} + 0.06 = 0.113 \text{ or } 11.3\%$$

(d) **Computation of overall weighted average after tax cost of additional finance**

| Particulars | (₹) | Weights | Cost of funds | Weighted Cost (%) |
|---|---|---|---|---|
| Equity | 10,00,000 | 1/3 | 11.3% | 3.767 |
| Debt | 20,00,000 | 2/3 | 6.125% | 4.083 |
| WACC | 30,00,000 | | | **7.85** |

**Alternative Solution**

(a) **Pattern of raising additional finance**

Equity 1/3 of ₹ 30,00,000 = ₹ 10,00,000

Debt 2/3 of ₹ 30,00,000 = ₹ 20,00,000

The capital structure after raising additional finance:

| Particulars | (₹) |
|---|---|
| **Shareholders' Funds** | |
| Equity Capital | 10,00,000 |
| Debt (Interest at 8% p.a.) | 20,00,000 |
| **Total Funds** | **30,00,000** |

(b) **Determination of post-tax average cost of additional debt**

$K_d$= I(1-t)

Where,

I= Interest Rate

T= Corporate tax-rate

$K_d$ = 8%(1-0.3)= 5.6%

(c) **Determination of cost of equity applying Dividend growth model:**

$$K_e = \frac{D_1}{P_0} + g$$

Where,

$K_e$ = Cost of equity

$D_1 = D_0 (1+ g)$

$D_0$ = Dividend paid

$g$ = Growth rate =6%

$P_0$ = Current market price per share = ₹ 120

Then, Ke = $\frac{6(1+0.06)}{120} + 0.06 = \frac{6.36}{120} + 0.06 = 0.113$ or 11.3%

(d) **Computation of overall weighted average after tax cost of additional finance**

| Particulars | (₹) | Weights | Cost of funds | Weighted Cost (%) |
|---|---|---|---|---|
| Equity | 10,00,000 | 1/3 | 11.3% | 3.767 |
| Debt | 20,00,000 | 2/3 | 5.6% | 3.733 |
| WACC | 30,00,000 | | | **7.50** |

**Q.15** Cost of Retained Earn / WACC | RTP Nov 23

Jason Limited is planning to raise additional finance of ₹ 20 lakhs for meeting its new project plans. It has ₹ 4,20,000 in the form of retained earnings available for investment purposes. Further details are as following:

| | |
|---|---|
| Debt / Equity Mix | 30 / 70 |
| Cost of Debt | 8 % (before tax) |
| Upto ₹ 3,60,000 | 12 % (before |
| Beyond ₹ 3,60,000 | tax) |
| Earnings per share | ₹ 4 |
| Dividend pay-out | 50% of earnings |
| Current Market Price per share | ₹ 44 |
| Expected Growth rate in Dividend | 10 % |
| Tax | 40% |

You are required:

(a) To determine the cost of retained earnings and cost of equity.

(b) To determine the post-tax average cost of additional debt.

(c) To determine the pattern for raising the additional finance, and

(d) Compute the overall weighted average after tax cost of additional finance.

**Ans.** (a) **Cost of Equity / Retained Earnings (using dividend growth model)**

$$K_e = \frac{D_1}{P_0}$$

Where D1= Do (1 + g) = 2 (1 + .10) = 2.2

$$K_e = \frac{2.2}{44} + 0.10 = 0.15 \text{ or } 15\ \%$$

(b) **Cost of Debt (Post Tax)**

Kd = I (1-t)

Upto 3,60,000 Kd = .08 (1-0.4) = 0.048

Beyond 3,60,000 = .12 (1-0.4) = 0.072

Thus, post-tax cost of additional debt = 0.048 x 3,60,000 / 6,00,000 + 0.072 x 2,40,000/ 6,00,000 = 0.0288 + 0.0288 = 0.0576 or 5.76%

(c) **Pattern for Raising Additional Finance**

Debt = 20,00,000 x 30% = 6,00,000

Equity = 20,00,000 x 70 % = 14,00,000

Out of this total equity amount of ₹ 14,00,000

Equity Shares = 14,00,000 – 4,20,000 = 9,80,000

And Retained Earnings = 4,20,000

(d) **Overall Weighted Average after tax cost of additional finance**

WACC = Kd x Debt Mix + Ke x Equity Mix = 0.0576 x 30% + 0.15 x 70% =0.01728+0.105 = 0.1223 or 12.23% (approx.

**Q.16** WACC | PY May 19

Alpha Ltd. has furnished the following information :

- Earning Per Share (EPS) ₹ 4
- Dividend payout ratio 25%
- Market price per share ₹ 50
- Rate of tax 30%
- Growth rate of dividend 10%

The company wants to raise additional capital of ₹ 10 lakhs including debt of ₹ 4 lakhs. The cost of debt (before tax) is 10% up to ₹ 2 lakhs and 15% beyond that. Compute the after tax cost of equity and debt and also weighted average cost of capital

**Ans.** **(i) Cost of Equity Share Capital (Ke)**

$$K_e = \frac{D_{0(1+g)}}{P_0} + g = \frac{25\% \text{ of } 4\ (1+0.10)}{50} + 0.10 = \frac{1.10}{50} + 0.10 = 0.122 \text{ or } 12.2\%$$

(ii) **Cost of Debt (Kd)**

$$K_d = \frac{Interest}{Net\ Proceeds} x100x(1-t)$$

Interest on first 2,00,000 @ 10%= 20,000

Interest on next 2,00,000 @ 15%= 30,000

$$K_d = \frac{50,000}{4,00,000} x(1-0.3) = 0.0875 \text{ or } 8.75\%$$

(iii) **Weighted average cost of capital (WACC)**

| Source of capital | Amount (₹) | Weights | Cost of Capital (%) | WACC (%) |
|---|---|---|---|---|
| Equity shares | 6,00,000 | 0.60 | 12.20 | 7.32 |

| | | | | |
|---|---|---|---|---|
| Debt | 4,00,000 | 0.40 | 8.75 | 3.50 |
| Total | 10,00,000 | 1.00 | | **10.82** |

Alternatively Cost of Equity Share Capital (Ke) can be calculated as

$$K_e = \frac{D}{P_0} + g = \frac{25\% \text{ of } 4}{50} + 0.10 = \frac{1.00}{50} + 0.10 = 0.120 \text{ or } 12.00\%$$

Accordingly

Weighted Average Cost of Capital (WACC)

| Source of capital | Amount (₹) | Weights | Cost of Capital (%) | WACC (%) |
|---|---|---|---|---|
| Equity shares | 6,00,000 | 0.60 | 12.00 | 7.20 |
| Debt | 4,00,000 | 0.40 | 8.75 | 3.50 |
| Total | 10,00,000 | 1.00 | | **10.70** |

**Q.17** WACC | RTP Nov 18

M/s. Navya Corporation has a capital structure of 40% debt and 60% equity. The company is presently considering several alternative investment proposals costing less than ₹ 20 lakhs. The corporation always raises the required funds without disturbing its present debt equity ratio.

The cost of raising the debt and equity are as under:

| Project cost | Cost of debt | Cost of equity |
|---|---|---|
| Upto ₹ 2 lakhs | 10% | 12% |
| Above ₹ 2 lakhs & upto to ₹ 5 lakhs | 11% | 13% |
| Above ₹ 5 lakhs & upto ₹10 lakhs | 12% | 14% |
| Above ₹10 lakhs & upto ₹ 20 lakhs | 13% | 14.5% |

Assuming the tax rate at 50%, CALCULATE:

(i) Cost of capital of two projects X and Y whose fund requirements are ₹ 6.5 lakhs and ₹ 14 lakhs respectively.

(ii) If a project is expected to give after tax return of 10%, DETERMINE under what conditions it would be acceptable?

**Ans.** **(i) Statement of Weighted Average Cost of Capital**

| Project cost | Financing | Proportion of capital Structure | After tax cost (1-Tax 50%) | Weighted average cost (%) |
|---|---|---|---|---|
| Upto ` 2 Lakhs | Debt | 0.4 | 10% (1 – 0.5) = 5% | 0.4 × 5 = 2.0 |
| | Equity | 0.6 | 12% | 0.6 × 12 = 7.2 |
| | | | | 9.2% |

| | | | | |
|---|---|---|---|---|
| Above ` 2 lakhs & upto to ` 5 | Debt | 0.4 | 11% (1 – 0.5) = 5.5% | 0.4 × 5.5 = 2.2 |

| | | | | |
|---|---|---|---|---|
| | Equity | 0.6 | 13% | 0.6 ×13 = 7.8 |
| | | | | 10.0% |
| Above ` 5 lakhs & upto ` 10 lakhs | Debt | 0.4 | 12% (1 – 0.5) = 6% | 0.4 × 6 = 2.4 |
| | Equity | 0.6 | 14% | 0.6 × 14 = 8.4 |
| | | | | 10.8% |
| Above ` 10 lakhs & upto ` 20 lakhs | Debt | 0.4 | 13% (1 – 0.5) = 6.5% | 0.4 × 6.5 = 2.6 |
| | Equity | 0.6 | 14.5% | 0.6 × 14.5 = 8.7 |
| | | | | 11.3% |

| Project | Fund requirement | Cost of capital |
|---|---|---|
| X | ₹6.5 lakhs | 10.8% (from the above table) |
| Y | ₹14 lakhs | 11.3% (from the above table) |

**(ii)** If a Project is expected to give after tax return of 10%, it would be acceptable provided its project cost does not exceed ₹ 5 lakhs or, after tax return should be more than or at least equal to the weighted average cost of capital.

**Q.18** WACC | MTP Nov 23(2)

Q Ltd. has the following capital structure at book-value as on 31st March 2022:

| Particulars | (₹) |
|---|---|
| Equity share capital (10,00,000 shares) | 4,00,00,000 |
| 12% Preference shares | 80,00,000 |
| 11% Debentures | 6,80,00,000 |

The equity shares of the company are sold for ₹ 400. It is expected that the company will pay next year a dividend of ₹ 20 per equity share, which is expected to grow by 5% p.a. forever. Assume a 30% corporate tax rate.

Required:

(i) COMPUTE weighted average cost of capital (WACC) of the company based on the existing capital structure.

(ii) COMPUTE the new WACC, if the company raises an additional ₹ 50 lakhs debt by issuing 12% debentures. This would result in increasing the expected equity dividend to ₹ 25 and leave the growth rate unchanged, but the price of equity share will fall to ₹ 300 per share.

**Ans.** (i) **Computation of Weighted Average Cost of Capital based on existing capital structure**

| Source of Capital | Existing Capital structure | Weights (a) | After tax cost of capital (%) | WACC (%) (a) × (b) |
|---|---|---|---|---|
| Equity share capital (W.N.1) | 4,00,00,000 | 0.588 | 10.00 | 5.88 |
| 12% Preference share capital | 80,00,000 | 0.118 | 12.00 | 1.42 |

| | | | | |
|---|---|---|---|---|
| 11% Debentures (W.N.2) | 2,00,00,000 | 0.294 | 7.70 | 2.26 |
| Total | 6,80,00,000 | 1.000 | | 9.56 |

**Working Notes:**

1. Cost of Equity Capital:

$$K_e = \frac{Expected\ dividend(D_{1})}{Current\ Market\ Price(P_{0})} + Growth(g)$$

$$= \frac{20}{400} + 0.05$$

$$= 10\%$$

2. Cost of 10% Debentures

$$K_d = \frac{Interest(1-t)}{Net\ Proceeds}$$

$$= \frac{22,00,000(1-0.30)}{2,00,00,000}$$

$$= 0.077 \text{ or } 7.7\%$$

(ii) **Computation of Weighted Average Cost of Capital based on new capital structure**

| Source of Capital | New Capital structure (₹) | Weights (a) | After tax cost of capital (%) | WACC (%) (a) x (b) |
|---|---|---|---|---|
| Equity share capital (W.N.3) | 4,00,00,000 | 0.548 | 13.33 | 7.30 |
| 12% Preference share capital | 80,00,000 | 0.110 | 12.00 | 1.32 |
| 11% Debentures (W.N.2) | 2,00,00,000 | 0.274 | 7.70 | 2.11 |
| 12% Debentures (W.N.4) | 50,00,000 | 0.068 | 8.40 | 0.57 |
| Total | 7,30,00,000 | 1.000 | | 11.30 |

**Working Notes:**

3. Cost of Equity Capital:

$$K_e = \frac{25}{300} + 0.05$$

$$=13.33\%$$

4. Cost of 12% Debentures

$$K_d = \frac{6,00,000(1-0.30)}{50,00,000}$$

$$= 0.084 \text{ or } 8.4\%$$

**Q.19** WACC | MTP May 22(1)

The capital structure of a Company is given below:

| Source of capital | Book Value |
|---|---|
| Equity shares @ ₹ 100 each | 24,00,000 |

| | |
|---|---|
| 9% Cumulative preference shares @ ₹ 100 each | 4,00,000 |
| 11% Debentures | 12,00,000 |
| | 40,00,000 |

The company had paid equity dividend @ 25% for the last year which is likely to grow @ 5% every year. The current market price of the company's equity share is ₹ 200.

Considering corporate tax @ 30%, you are required to CALCULATE:

(i) Cost of capital for each source of capital.

(ii) Weighted average cost of capital.

**Ans.**

(i) **Calculation of Cost of Capital for each source of capital:**

(a) Cost of Equity share capital:

$$K_a = \frac{D_0(1+g)}{Market\ Price\ per\ share(P_{0)}} + g = \frac{25\% x 100(1+0.05)}{200} + 0.05$$

$$= \frac{26.26}{200} + 0.05 = 0.18125 \text{ or } 18.125\%$$

(b) Cost of Preference share capital ($K_p$)= 9%

(c) Cost of Debentures ($K_d$) = r (1 – t)

= 11% (1 – 0.3) = 7.7%

(ii) **Weighted Average Cost of Capital**

| Source | Amount (₹) | Weights | After tax Cost of Capital | WACC (%) |
|---|---|---|---|---|
| Equity share | 24,00,000 | 0.60 | 18.125 | 10.875 |
| 9% Preference share | 4,00,000 | 0.10 | 9.000 | 0.900 |
| 11% Debentures | 12,00,000 | 0.30 | 7.700 | 2.310 |
| | 40,00,000 | 1.00 | | **14.08** |

**Q.20** WACC | MTP May 21(1)

The following is the capital structure of Sharda Ltd. as on 31.12.2020:

| | (₹) |
|---|---|
| Equity shares: 2,00,000 shares (of ₹ 100 each) | 2,00,00,000 |
| 9% Preference Shares (of ₹ 100 each) | 60,00,000 |
| 8% Debentures | 90,00,000 |

The market price of the company's share is ₹ 120 and it is expected that a dividend of ₹ 12 per share would be declared for the year 2021. The dividend growth rate is 5% and the company is in the 30% tax bracket.

(i) CALCULATE the company's weighted average cost of capital.

(ii) Further, in order to finance an expansion plan, the company intends to borrow a fund of ₹ 2 crores bearing 12% rate of interest. In this situation, WHAT will be the company's revised weighted average cost of capital? This financing decision is expected to increase dividend from ₹ 12 to ₹ 14 per share. However, the market price of equity share is expected to decline from ₹ 120 to ₹ 115 per share.

In case of both (i) and (ii) above, use market value weight while calculating weighted average cost of capital

**Ans.** (i) **Computation of the weighted average cost of capital**

| Source of finance | Market Value of capital (₹) | Weight (b) | After tax Cost of capital (%) | WACC (%) (d) = (b) × (c) |
|---|---|---|---|---|
| Equity share (Working note 1) [₹120 × 2,00,000 shares] | 2,40,00,000 | 0.6154 | 15 | 9.231 |
| 9% Preference share | 60,00,000 | 0.1538 | 9 | 1.3842 |
| 8% Debentures | 90,00,000 | 0.2308 | 5.60 | 1.2925 |
| | 3,90,00,000 | 1.0000 | | 11.9077 |

(ii) **Computation of Revised Weighted Average Cost of Capital**

| Source of finance | Market Value of capital | Weight | After tax Cost of capital (%) | WACC (%) |
|---|---|---|---|---|
| Equity shares (Working note 2) [₹115 × 2,00,000 shares] | 2,30,00,000 | 0.3966 | 17.17 | 6.8096 |
| 9% Preference shares | 60,00,000 | 0.1034 | 9.00 | 0.9306 |
| 8% Debentures | 90,00,000 | 0.1552 | 5.60 | 0.8691 |
| 12% Loan | 2,00,00,000 | 0.3448 | 8.40 | 2.8963 |
| | 5,80,00,000 | 1.0000 | | 11.5056 |

**Working Notes:**

(1) **Cost of Equity Shares**

Ke = {Dividend Per Share (D1)/Market Price Share (P0)} + Growth Rate
= 12/120 + 0.05
= 0.15 or 15%

(2) **Revised cost of equity shares (Ke) Revised Ke**

= 14/115 + 0.05
= 0.1717 or 17.17%

**Q.21** WACC | MTP May 20

ABC Limited has the following book value capital structure:

| | |
|---|---|
| Equity Share Capital (1 crore shares @ Rs.10 each) | Rs.1,000 lakh |
| Reserves and Surplus | Rs.2,250 lakh |
| 9% Preference Share Capital (5 lakh shares @ Rs.100 each) | Rs.500 lakh |
| 8.5% Debentures (1.5 lakh debentures @ Rs.1,000 each) | Rs.1,500 lakh |
| 12% Term Loans from Financial Institutions | Rs.500 lakh |

The debentures of ABC Limited are redeemable at par after five years and are quoting at Rs.985 per debenture. The current market price per equity share is Rs.60. The prevailing default-risk free interest rate on 10-year GOI Treasury Bonds is 5.5%. The average market risk premium is 7%. The beta of the company is 1.85

The preference shares of the company are redeemable at 10% premium after 5 years is currently selling at Rs.102 per share.The applicable income tax rate for the company is 35%.
Required: CALCULATE weighted average cost of capital of the company using market value weights.

**Ans.** Working Notes:

(1) **Computation of cost of debentures** (Kd) :

$$K_d = \frac{85(1-0.35)+\frac{(1,000-985)}{5}}{\frac{(1,000+985)}{2}} = \frac{55.25+3}{992.5} = 0.0586 \text{ or } 5.86\%$$

(2) **Computation of cost of term loans (KT)** :

=r(1-t)

0.12(1-0.35) = 0.078 or 7.8%

(3) **Computation of cost of preference capital (KP) :**

$$K_p = \frac{\text{Preference Dividend}+(RV-NP)/n}{(RV+NP)/2}$$

$$\frac{9+\frac{(110-102)}{5}}{\frac{(110+102)}{2}} = \frac{9+1.6}{106} = 0.1 \text{ or } 10\%$$

(4) **Computation of cost of equity (Ke) :**

= Rf + ß(Rm – Rf)

Or, = Risk free rate + (Beta × Risk premium)

= 0.055 + (1.85 □ 0.07) = 0.1845 or 18.45%

Calculation of Weighted Average cost of capital Using market value weights

| Source of Capital | Market value of capital structure | Weights | After tax cost of | WACC (%) |
|---|---|---|---|---|
| Equity share capital (1 crore shares × Rs.60 ) | 6,000 | 0.71 | 18.45 | 13.09 |
| 9% Preference share capital (5 lakh shares □ Rs.102) | 510 | 0.06 | 10.00 | 0.60 |
| 8.5 % Debentures (1.5 lakh □ Rs.985) | 1,477.5 | 0.17 | 5.86 | 0.99 |
| 12% Term loans | 500 | 0.06 | 7.80 | 0.47 |
| | 8,487.50 | 1.000 | | 15.15 |

**Q.22** WACC | MTP Nov 18(2)

**PQR Ltd. has the following capital structure on October 31, 20X8:**

| Sources of capital | (Rs.) |
|---|---|
| Equity Share Capital (2,00,000 Shares of Rs. 10 each) | 20,00,000 |
| Reserves & Surplus | 20,00,000 |

| | |
|---|---|
| 12% Preference Shares | 10,00,000 |
| 9% Debentures | 30,00,000 |
| | 80,00,000 |

The market price of equity share is Rs. 30. It is expected that the company will pay next year a dividend of Rs. 3 per share, which will grow at 7% forever. Assume 40% income tax rate.
You are required to COMPUTE weighted average cost of capital using market value weights.

**Ans.**

(i) Cost of Equity (Ke) = $\frac{D_1}{P_0} + g = \frac{3}{30} + 0.07 = 0.1 + 0.07 = 0.17 = 17\%$

(ii) Cost of Debentures (Kd) = 9 % (1-0.4) = 5.6%

Computation of Weighted Average Cost of Capital (WACC using market value weights)

| Source of capital | Market Value of | Weight | Cost of capital (%) | WACC (%) |
|---|---|---|---|---|
| 9% Debentures | 30,00,000 | 0.30 | 5.40 | 1.62 |
| 12% Preference Shares | 10,00,000 | 0.10 | 12.00 | 1.20 |
| Equity Share Capital (Rs.30 × 2,00,000 shares) | 60,00,000 | 0.60 | 17.00 | 10.20 |
| Total | 1,00,00,000 | 1.00 | | 13.02 |

**Q.23** WACC | MTP Nov 18(1)

PQR Ltd. has the following capital structure on October 31, 20X8:

| Sources of capital | (Rs.) |
|---|---|
| Equity share capital (2,00,000 shares of Rs.10 each) | 20,00,000 |
| Reserves & surplus | 20,00,000 |
| 12% Preference share capital | 10,00,000 |
| 9% Debentures | 30,00,000 |
| | 80,00,000 |

The market price of equity share is Rs. 30. It is expected that the company will pay next year a dividend of Rs. 3 per share, which will grow at 7% forever. Assume 40% income tax rate.
You are required to COMPUTE weighted average cost of capital using market value weights.

**Ans.** Workings:

(i) Cost of Equity (Ke) = $\frac{D_1}{P_o} + g = \frac{3}{30} + 0.07 =$ 0.1+0.07 = 0.17 = 17%

(ii) Cost of Debentures (Kd) = I (1 - t) = 0.09 (1 - 0.4) = 0.054 or 5.4%

**Computation of Weighted Average Cost of Capital (WACC using market value weights)**

| Source of capital | Market Value of capital | Weight | Cost of capital (%) | WACC (%) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 9% Debentures | 30,00,000 | 0.30 | 5.40 | 1.62 |
| 12% Preference Shares | 10,00,000 | 0.10 | 12.00 | 1.20 |
| Equity Share Capital (Rs. 30 × 2,00,000 shares) | 60,00,000 | 0.60 | 17.00 | 10.20 |
| Total | 1,00,00,000 | 1.00 | | 13.02 |

**Q.24** WACC | MTP Nov18(1)

JKL Ltd. has the following book-value capital structure as on March 31, 20X8.

| | (Rs.) |
|---|---|
| Equity share capital (2,00,000 shares) | 40,00,000 |
| 11.5% Preference shares | 10,00,000 |
| 10% Debentures | 30,00,000 |
| | 80,00,000 |

The equity shares of the company are sold at Rs. 20. It is expected that the company will pay next year a dividend of Rs. 2 per equity share, which is expected to grow by 5% p.a. forever. Assume a 35% corporate tax rate.

Required:

(i) COMPUTE weighted average cost of capital (WACC) of the company based on the existing capital structure.

(ii) COMPUTE the new WACC, if the company raises an additional Rs. 20 lakhs debt by issuing 12% debentures. This would result in increasing the expected equity dividend to Rs. 2.40 and leave the growth rate unchanged, but the price of equity share will fall to Rs.16 per share.

**Ans.** (i) **Computation of Weighted Average Cost of Capital based on existing capital structure**

| Source of Capital | Existing Capital structure (Rs.) | Weights | After tax cost of capital (%) | WACC (%) |
|---|---|---|---|---|
| Equity share capital (W.N.1) | 40,00,000 | 0.500 | 15.00 | 7.500 |
| 11.5% Preference share capital (W.N.2) | 10,00,000 | 0.125 | 11.50 | 1.437 |
| 10% Debentures (W.N.3) | 30,00,000 | 0.375 | 6.50 | 2.438 |
| | 80,00,000 | 1.000 | | 11.375 |

Working Notes (W.N.)

1. **Cost of equity capital:**

$$K_e = \frac{Expected\,Dividend(D_1)}{Current\,Market\,Price\,per\,Share(P_0)} + Growth(g)$$

$$\frac{2}{20} + 0.05 = 0.15 \text{ or } 15\ \%$$

2. **Cost of preference share capital:**

$$= \frac{Annual\ preference\ share\ dividend(PD)}{Net\,proceed\,sin\,the\,issue\,of\,preference\,share(NP)}$$

$$\frac{1,15,000}{10,00,000} = 0.115 \text{ or } 11.5\%$$

**3. Cost of 10% Debentures:**

$$= \frac{I(1-t)}{NP} = \frac{3,00,000(1-0.35)}{30,00,000} = 0.065 \text{ or } 6.5\%$$

(ii) **Computation of Weighted Average Cost of Capital based on new capital structure**

| Source of Capital | New Capital structure (Rs.) | Weights (b) | After tax cost of capital (%) | WACC (%) (a) × (b) |
|---|---|---|---|---|
| Equity share capital (W.N. 4) | 40,00,000 | 0.40 | 20.00 | 8.00 |
| Preference share (W.N. 2) | 10,00,000 | 0.10 | 11.50 | 1.15 |
| 10% Debentures (W.N. 3) | 30,00,000 | 0.30 | 6.50 | 1.95 |
| 12% Debentures (W.N.5) | 20,00,000 | 0.20 | 7.80 | 1.56 |
| | 1,00,00,000 | 1.00 | | 12.66 |

Working Notes (W.N.):

**4. Cost of equity capital:**

$$K_e = \frac{Expected Dividend(D_1)}{Current Market Price per share(P_0)} + Growth(g) = \frac{2.40}{16} + 5\% = 20\%$$

**5. Cost of 12% Debentures**

$$K_d = \frac{2,40,000(1-0.35)}{20,00,000} = 0.078 \text{ or } 7.8\%$$

**Q.25** WACC | MTP May 18

G Limited has the following capital structure, which it considers to be optimal

| Capital Structure | Weightage (in %) |
|---|---|
| Debt | 25 |
| Preference Shares | 15 |
| Equity Shares | 60 |
| | 100 |

G Limited's expected net income this year is ₹ 34,285.72, its established dividend payout ratio is 30 per cent, its tax rate is 40 per cent, and investors expect earnings and dividends to grow at a constant rate of 9 per cent in the future. It paid a dividend of ₹ 3.60 per share last year, and its shares currently sells at a price of ₹ 54 per share.G Limited requires additional funds which it can obtain in the following ways:

- Preference Shares: New preference shares with a dividend of ₹ 11 can be sold to the public at a price of ₹95 per share.
- Debt: Debt can be sold at an interest rate of 12 per cent. You are required to:
  - (i) DETERMINE the cost of each capital structure component; and
  - (ii) COMPUTE the weighted average cost of capital (WACC) of G Limited.

**Ans.** (i) **Computation of Costs of Different Components of Capital:**

(a) Equity Shares:

$$K_e = \frac{D_1}{P0} + g = \frac{D_0(1+g)}{P_0} + g$$

$$= \frac{3.60(1.09)}{54} + 0.09 = 0.0727 + 0.09 = 16.27\%$$

(b) Preference Shares:

$$K_p = \frac{\text{Preference Share Dividend}}{P_0} = \frac{11}{95} = 11.58\%$$

(c) Debt at 12%

$K_d (1 - t) = 12\% (1 - 0.4) = 12\% \times 0.6 = 7.20\%.$

(ii) **Weighted Average Cost of Capital (WACC)**

WACC = WdKd + WpKp + WeKe

WACC = 0.25 (7.2%) + 0.15 (11.58%) + 0.60 (16.27%)

= 1.8 + 1.737 + 9.762 = 13.30%.

**Q.26** WACC | PY Nov 22

The following is the extract of the Balance Sheet of M/s KD Ltd.:

| *Particulars* | *Amount (₹)* |
|---|---|
| *Ordinary shares (Face Value ₹ 10/- per share)* | *5,00,000* |
| *Share Premium* | *1,00,000* |
| *Retained Profits* | *6,00,000* |
| *8% Preference Shares (Face Value ₹25/- per share)* | *4,00,000* |
| *12% Debentures (Face value ₹100/- each)* | *6,00,000* |
| | *22,00,000* |

The ordinary shares are currently priced at ₹ 39 ex-dividend and preference share is priced at ₹ 18 cum-dividend. The debentures are selling at 120 percent ex-interest. The applicable tax rate to KD Ltd. is 30 percent. KD Ltd.'s cost of equity has been estimated at 19 percent. Calculate the WACC (weighted average cost of capital) of KD Ltd. on the basis of market value.

**Ans.** **W.N. 1**

Cum-dividend price of Preference shares = ₹ 18

Less: Dividend (8/100) x 25 = ₹ 2

∴ Market Price of Preference shares = ₹ 16

$$K_p = \frac{2}{16} = 0.125 \text{ (or) } 12.5\%$$

$$\text{No. of Preference shares} = \left(\frac{4,00,000}{25}\right) = 16,000$$

**W.N. 2**

$$\text{Market price of Debentures} = \left(\frac{120}{100}\right) x100 = Rs\ 120$$

$K_d = \left[\frac{12(1-0.3)}{120}\right]$ = 0.07 (or) 7%

No. of Debentures = $\left(\frac{6,00,000}{100}\right)$ = 6,000

**W.N.3**

Market Price of Equity shares = Rs 39

Ke (given) = 19% or 0.19

No. of Equity shares = 5, 00, 000 = 50,000

| Sources | Market Value | Nos. | Total Market value (₹) | Weight | Cost of Capital | Product |
|---|---|---|---|---|---|---|
| Equity Shares | 39 | 50,000 | 19,50,000 | 0.6664 | 0.19 | 0.1266 |
| Preference Shares | 16 | 16,000 | 2,56,000 | 0.0875 | 0.125 | 0.0109 |
| Debentures | 120 | 6,000 | 7,20,000 | 0.2461 | 0.07 | 0.0172 |
| | | | | | WACC = | 0.1547 |

WACC = 0.1547 or 15.47%

**Q.27** WACC MTP Nov 22(2)

The financial advisor of Sun Ltd is confronted with following two alternative financing plans for raising ₹ 10 lakhs that is needed for plant expansion and modernization

**Alternative I:** Issue 80% of funds with 14% Debenture [Face value (FV) ₹ 100] at par and redeem at a premium of 10% after 10 years and balance by issuing equity shares at 33 $\frac{1}{3}$ % premium.

**Alternative II:** Raise 10% of funds required by issuing 8% Irredeemable Debentures [Face value (FV) ₹ 100] at par and the remaining by issuing equity shares at current market price of ₹125. Currently, the firm has an Earnings per share (EPS) of ₹ 21

The modernization and expansion programme is expected to increase the firm's Earnings before Interest and Taxation (EBIT) by ₹ 200,000 annually.

The firm's condensed Balance Sheet for the current year is given below:

**Balance Sheet as on 31.3.2022**

| Liabilities | Amount (₹) | Assets | Amount (₹) |
|---|---|---|---|
| Current Liabilities | 5,00,000 | Current Assets | 16,00,000 |
| 10% Long Term Loan | 15,00,000 | Plant & Equipment (Net) | 34,00,000 |
| Reserves & Surplus | 10,00,000 | | |
| Equity Share Capital (FV: ₹ 100 each) | 20,00,000 | | |
| TOTAL | 50,00,000 | TOTAL | 50,00,000 |

However, the finance advisor is concerned about the effect that issuing of debt might have on the firm. The average debt ratio for firms in industry is 35%.He believes if this ratio is exceeded, the P/E ratio of the company will be 7 because of the potentially greater risk.

If the firm increases its equity capital by more than 10 %, he expects the P/E ratio of the company will increase to 8.5 irrespective of the debt ratio.

Assume Tax Rate of 25%. Assume target dividend pay-out under each alternative to be 60% for the next year and growth rate to be 10% for the purpose of calculating Cost of Equity

SUGGEST with reason which alternative is better on the basis of each of the below given criteria:

I. Earnings per share (EPS) & Market Price per share (MPS)

II. Financial Leverage

III. Weighted Average Cost of Capital & Marginal Cost of Capital (using Book Value weights)

**Ans.**

**Calculation of Equity Share capital and Reserves and surplus: Alternative 1:**

Equity Share capital = ₹20,00,000+ $\frac{2,00,000x100}{133.3333}$ = 21,50,000

Reserves= ₹10,00,000 + $\frac{2,00,000x33.3333}{133.3333}$ =₹10,50,000

Alternative 2:

Equity Share capital = ₹ 20,00,000 + $\frac{9,00,000x\ 100}{125}$ =₹27,20,000

Reserves= ₹10,00,000 + $\frac{9,00,000x\ 100}{125}$ =₹11,80,000

Capital Structure Plans

Amount in ₹

| Capital | Alternative 1 | Alternative 2 |
|---|---|---|
| Equity Share capital | 21,50,000 | 27,20,000 |
| Reserves and surplus | 10,50,000 | 11,80,000 |
| 10% long term debt | 15,00,000 | 15,00,000 |
| 14% Debentures | 8,00,000 | - |
| 8% Irredeemable Debentures | - | 1,00,000 |
| Total Capital Employed | 55,00,000 | 55,00,000 |

Computation of Present Earnings before interest and tax (EBIT)

| EPS (₹) | 21 |
|---|---|
| No. of equity shares | 20,000 |
| Earnings for equity shareholders (I x II) (₹) | 4,20,000 |
| Profit Before Tax (III/75%) (₹) | 5,60,000 |
| Interest on long term loan (1500000 x 10%) (₹) | 1,50,000 |
| EBIT (IV + V) (₹) | 7,10,000 |

EBIT after expansion = ₹7,10,000 +₹ 2,00,000 = ₹9,10,000

**Evaluation of Financial Plans on the basis of EPS, MPS and Financial Leverage**

Amount in ₹

| Particulars | Alternative I | Alternate II |
|---|---|---|
| EBIT | 9,10,000 | 9,10,000 |
| Less: Interest: 10% on long term loan | (1,50,000) | (1,50,000) |
| 14% on Debentures | (1,12,000) | Nil |
| 8% on Irredeemable Debentures | Nil. | (8000) |
| PBT | 6,48,000 | 7,52,000 |
| Less: Tax @25% | (1,62,000) | (1,88,000) |
| PAT | 4,86,000 | 5,64,000 |
| No. of equity shares | 21,500 | 27,200 |
| **EPS** | **22.60** | **20.74** |
| Applicable P/E ratio (Working Note 1) | 7 | 8.5 |
| **MPS (EPS X P/E ratio)** | **158.2** | **176.29** |
| **Financial Leverage EBIT/PBT** | **1.40** | **1.21** |

**Working Note 1**

| | Alternative I | Alternative II |
|---|---|---|
| Debt: | | |
| ₹15,00,000 +₹8,00,000 | 23,00,000 | - |
| ₹15,00,000 +₹1,00,000 | - | 16,00,000 |
| Total capital Employed (₹) | 55,00,000 | 55,00,000 |
| Debt Ratio (Debt/Capital employed) | =0.4182 | =0.2909 |
| | **=41.82%** | =29.09% |
| Change in Equity: ₹21,50,000-₹20,00,000 | 1,50,000 | |
| ₹27,20,000-₹20,00,000 | | 7,20,000 |
| Percentage change in equity | 7.5% | **36%** |
| Applicable P/E ratio | **7** | **8.5** |
| | | |

**Calculation of Cost of equity and various type of debt**

| | Alternative I | Alternative II |
|---|---|---|
| **A) Cost of equity** | | |
| EPS | 22.60 | 20.74 |
| DPS (EPS X 60%) | 13.56 | 12.44 |
| Growth (g) | 10% | 10% |
| Po (MPS) | 158.2 | 176.29 |
| Ke= Do (1 + g)/ Po | $\frac{13.56\ (1.1)}{158.2}$ | $\frac{12.44(1.1)}{176.29}$ |
| | =9.43% | =7.76% |
| B) Cost of Debt: | | |
| 10% long term debt | 10% + (1-0.25) | 10% +(1-0.25) |
| | = 7.5% | = 7.5% |
| 14% redeemable debentures | $\frac{14(1-0.25)+(110-100/10)}{110+100/2}$ | nil |
| | = 10.5 + 1 / 10.5 | |
| | = 10.95% | |
| 8% irredeemable debenture | NA | 8000(1-0.25)/1,00,00 = 6% |

**Calculation of Weighted Average cost of capital (WACC)**

| | Alternative 1 | | | Alternative 2 | | |
|---|---|---|---|---|---|---|
| Capital | Weights | Cost (%) | WACC | Weights | Cost (%) | WACC |
| Equity Share Capital | 0.3909 | 9.43 | 3.69% | 0.4945 | 7.76 | 3.84% |
| Reserves and Surplus | 0.1909 | 9.43 | 1.80% | 0.2145 | 7.76 | 1.66% |
| 10% Long term Debt | 0.2727 | 7.50 | 2.05% | 0.2727 | 7.50 | 2.05% |
| 14% Debenture | 0.1455 | 10.95 | 1.59% | | | |
| 8% Irredeemable Debentures | - | | | 0.0182 | 6 | 0.11% |
| | | | **9.12%** | | | **7.66%** |

**Calculation Marginal Cost of Capital (MACC)**

| | Alternative 1 | Alternative 2 |
|---|---|---|

| Capital | Amount(weight) | Cost (%) | MACC | Amount (weight) | Cost (%) | MACC |
|---|---|---|---|---|---|---|
| Equity Share Capital | ₹ 1,50,000(0.15) | 9.43 | 1.41% | ₹7,20,000(0.72) | 7.76 | 5.59% |
| Reserves and Surplus | ₹ 50,000(0.05) | 9.43 | 0.47% | ₹1,80,000(0.18) | 7.76 | 1.40% |
| 14% Debenture | ₹ 8,00,000(0.80) | 10.95 | 8.76% | - | | 0.00% |
| 8% Irredeemable Debentures | - | | | ₹1,00,000(0.10) | 6 | 0.60% |
| Total Capital Employed | ₹10,00,000 | | **10.65%** | ₹10,00,000 | | **7.58%** |

**Summary of solution:**

| | Alternate I | Alternate II |
|---|---|---|
| Earning per share (EPS) | 22.60 | 20.74 |
| Market price per share (MPS) | 158.20 | 176.29 |
| Financial leverage | 1.4043 | 1.2101 |
| Weighted Average cost of capital (WACC) | 9.12% | 7.66% |
| Marginal cost of capital (MACC) | 10.65% | 7.58% |

**Alternative 1 of financing will be preferred under the criteria of EPS, whereas Alternative II of financing will be preferred under the criteria of MPS, Financial leverage, WACC and marginal cost of capital.**

**Q.28** WACC / Marginal | MTP Nov 19

**ABC Ltd. has the following capital structure which is considered to be optimum as on 31st March, 2019**

| | (Rs.) |
|---|---|
| 14% Debentures | 30,00,000 |
| 11% Preference shares | 10,00,000 |
| Equity Shares (10,000 shares) | 1,60,00,000 |
| | 2,00,00,000 |

The company share has a market price of Rs. 236. Next year dividend per share is 50% of year 2019 EPS. The following is the trend of EPS for the preceding 10 years which is expected to continue in future.

| Year | EPS (Rs.) | Year | EPS Rs.) |
|---|---|---|---|
| 2010 | 10.00 | 2015 | 16.10 |
| 2011 | 11.00 | 2016 | 17.70 |
| 2012 | 12.10 | 2017 | 19.50 |
| 2013 | 13.30 | 2018 | 21.50 |
| 2014 | 14.60 | 2019 | 23.60 |

The company issued new debentures carrying 16% rate of interest and the current market price of debenture is Rs. 96.

Preference share Rs. 9.20 (with annual dividend of Rs. 1.1 per share) were also issued. The company is in 50% tax bracket.

(A) CALCULATE after tax:
- (i) Cost of new debt
- (ii) Cost of new preference shares
- (iii) New equity share (consuming new equity from retained earnings)

(B) CALCULATE marginal cost of capital when no new shares are issued.

(C) COMPUTE the amount that can be spent for capital investment before new ordinary shares must

be sold. Assuming that retained earnings for next year's investment are 50 percent of 2019.

(D) COMPUTE marginal cost of capital when the funds exceeds the amount calculated in (C), assuming new equity is issued at Rs. 200 per share?

**Ans** **(A)** **(i) Cost of new debt**

$$K_d = \frac{I(1-t)}{p_\circ}$$

$$= \frac{16(1-0.5)}{96} = 0.0833$$

**(ii) Cost of new preference shares**

$$K_p = \frac{PD}{p_\circ} = \frac{1.1}{9.2} = 0.12$$

**(iii) Cost of new equity shares**

$$K_e = \frac{D_1}{P_\circ} + g$$

$$= \frac{11.80}{236} + 0.10 + 0.05 + 0.10 = 0.15$$

**Calculation of D1**

$D_1$ = 50% of 2019 EPS = 50% of 23.60 = Rs. 11.80.

**(B)** Calculation of marginal cost of capital

| Type of Capital | Proportion | Specific Cost | Product |
|---|---|---|---|
| (1) | (2) | (3) | (2) × (3) = (4) |
| Debenture | 0.15 | 0.0833 | 0.0125 |
| Preference Share | 0.05 | 0.12 | 0.0060 |
| Equity Share | 0.80 | 0.15 | 0.1200 |
| | Marginal cost of capital | | 0.1385 |

**(C)** The company can spend the following amount without increasing marginal cost of capital and without selling the new shares:

Retained earnings = (0.50) (236 × 10,000) = Rs. 11,80,000

The ordinary equity (Retained earnings in this case) is 80% of total capital = 80% of Total Capital

Capital investment before issuing equity = $\frac{11,80,000}{0.80}$ = Rs.14,75,000

**(D)** If the company spends in excess of Rs.14,75,000 it will have to issue new shares.

The cost of new issue will be = $\frac{11.80}{200} + 0.10 = 0.159$

The marginal cost of capital will be:

| Type of Capital | Proportion | Specific Cost | Product |
|---|---|---|---|
| (1) | (2) | (3) | (2) × (3) = (4) |
| Debentures | 0.15 | 0.0833 | 0.0125 |
| Preference Shares | 0.05 | 0.1200 | 0.0060 |
| Equity Shares (New) | 0.80 | 0.1590 | 0.1272 |
| | | | 0.1457 |

**Q.29** WACC | RTP Dec 21

Kalyanam Ltd. has an operating profit of ₹ 34,50,000 and has employed Debt which gives total Interest Charge of ₹ 7,50,000. The firm has an existing Cost of Equity and Cost of Debt as 16% and 8% respectively. The firm has a new proposal before it, which requires funds of ₹ 75 Lakhs and is expected to bring an additional profit of ₹ 14,25,000. To finance the proposal, the firm is expecting to issue an additional debt at 8% and will not be issuing any new equity shares in the market. Assume no tax culture.

You are required to CALCULATE the Weighted Average Cost of Capital (WACC) of Kalyanam Ltd.:

(i) Before the new Proposal

(ii) After the new Proposal

**Ans.** Workings:

(a) Value of Debt $= \frac{\text{Interest}}{\text{cost of debt } (k_d)}$

$= \frac{7,50,000}{0.08} = ₹\ 93,75,000$

(b) Value of equity capital $= \frac{\text{Operating profit - Interest}}{\text{Cost of equity } (K_e)}$

$= \frac{34,50,000 - 7,50,000}{0.16} = ₹\ 1,68,75,000$

(c) New Cost of equity ($K_e$) after proposal

$= \frac{\text{Increased Operating profit - Interest on Increased debt}}{\text{Equity capital}}$

$= \frac{(34,50,000 + 14,25,000) - (7,50,000 + 6,00,000)}{1,68,75,000}$

$= \frac{48,75,000 - 13,50,000}{1,68,7500} = \frac{35,25,000}{1,68,75000} = 0.209 \text{ or } 20.9\%$

(i) Calculation of Weighted Average Cost of Capital (WACC) before the new proposal

| Sources | Amount (₹) | Weight | Cost of Capital | WACC |
|---|---|---|---|---|
| Equity | 1,68,75,000 | 0.6429 | 0.160 | 0.1029 |
| Debt | 93,75,000 | 0.3571 | 0.080 | 0.0286 |
| **Total** | **2,62,50,000** | **1** | | **0.1315 or 13.15 %** |

(ii) Calculation of Weighted Average Cost of Capital (WACC) after the new proposal

| Sources | Amount (₹) | Weight | Cost of Capital | WACC |
|---|---|---|---|---|
| Equity | 1,68,75,000 | 0.5000 | 0.209 | 0.1045 |
| Debt | 1,68,75,000 | 0.5000 | 0.080 | 0.0400 |
| **Total** | **3,37,50,000** | **1** | | **0.1445 or 14.45 %** |

**Q.30** WACC before & after Proposal | RTP Maay 20

PK Ltd. has the following book-value capital structure as on March 31, 2020.

| | (₹) |
|---|---|
| Equity share capital (10,00,000 shares) | 2,00,00,000 |
| 11.5% Preference shares | 60,00,000 |
| 10% Debentures | 1,00,00,000 |
| | 3,60,00,000 |

The equity shares of the company are sold for ₹ 200. It is expected that the company will pay next year a dividend of ₹ 10 per equity share, which is expected to grow by 5% p.a. forever. Assume a 35% corporate tax rate.

Required:

(i) COMPUTE weighted average cost of capital (WACC) of the company based on the existing capital structure.

(ii) COMPUTE the new WACC, if the company raises an additional ₹50 lakhs debt by issuing 12% debentures. This would result in increasing the expected equity dividend to ₹12.40 and leave the growth rate unchanged, but the price of equity share will fall to ₹ 160 per share.

**Ans**

(i) Computation of Weighted Average Cost of Capital based on existing capital structure

| Source of Capital | Existing Capital structure (₹) | Weights (a) | After tax cost of capital (%) (b) | WACC (%) (a) X(b) |
|---|---|---|---|---|
| Equity share capital (W.N.1) | 2,00,00,000 | 0.555 | 10.00 | 5.55 |
| 11.5% Preference share capital | 60,00,000 | 0.167 | 11.50 | 1.92 |
| 10% Debentures (W.N.2) | 1,00,00,000 | 0.278 | 6.50 | 1.81 |
| | 3,60,00,000 | 1.000 | | 9.28 |

Working Notes (W.N.):

1. Cost of equity capital:

$$K_e = \frac{\text{Expected Dividend } (D_1)}{\text{Current Market Priceper share (po)}} + \text{Growth } (g)$$

$$= \frac{10}{200} + 0.05$$

$$= 10\%$$

2. Cost of 10% Debentures:

$$= \frac{I\,(1-t)}{NP} = \frac{10,00,000(1-0.35)}{100,00,000} = 0.065 \text{ or } 6.5\%$$

(ii) Computation of Weighted Average Cost of Capital based on new capital structure

| Source of Capital | New Capital structure (₹) | Weights (b) | After tax cost of capital (%)(a) | WACC (%) (a) X (b) |
|---|---|---|---|---|
| Equity share capital (W.N. 3) | 2,00,00,000 | 0.488 | 12.75 | 6.10 |
| Preference share | 60,00,000 | 0.146 | 11.50 | 1.68 |
| 10% Debentures (W.N. 2) | 1,00,00,000 | 0.244 | 6.50 | 1.59 |
| 12% Debentures (W.N.4) | 50,00,000 | 0.122 | 7.80 | 0.95 |
| | 4,10,00,000 | 1.00 | | 10.32 |

**Working Notes (W.N.):**

3. **Cost of equity capital:**

$$K_e = \frac{\text{Expected Dividend}(D_1)}{\text{Current Market Price per share}(P_0)} + \text{Growth (g)}$$

$$\frac{12.4}{160} + 0.05 = 0.1275 \text{ or } 12.75\%$$

4. **Cost of 12% Debentures**

$$= \frac{6,00,000(1-0.35)}{50,00,000} = 0.078 \text{ or } 7.8\%$$

$$K_d = \frac{24,0000(1-0.35)}{20,00,000} = 0.078 \text{ or } 7.8\%$$

**Q.31** WACC before & after proposal | MTP May 22(2)

Genzy Ltd. is planning to introduce a new product with a project life of 10 years. The initial equipment cost will be ₹ 2.5 crores. At the end of 10 years, the equipment will have a resale value of 50 lakhs. A working capital of ₹ 30,00,000 will be needed and it will be released at the end of the tenth year. The project will be financed with the following capital sources.

| Particulars | Amount (₹) | Issue Price (Market price) |
|---|---|---|
| Equity Share Capital of Face value ₹ 10 each | 1,50,00,000 | ₹30 |
| Debentures of face value ₹ 100 each with a maturity of 10 years | 90,00,000 | ₹90 |
| Preference shares of ₹ 100 each with a maturity of 10 years | 60,00,000 | ₹96 |

The existing yield on T-bills is averaging 8% p.a. The systematic risk measure for the proposed project is 1.6. NSE NIFTY is expected to yield 14% p.a. on average for the foreseeable future. Debenture holders have been promised a coupon of 12% and preference shareholders have been committed a dividend of 15%.

**The sales volumes over 10 years have been estimated as follows:**

| Year | 1 | 2 | 3-5 | 6-8 | 9-10 |
|---|---|---|---|---|---|
| Units per year | 70,000 | 98,000 | 2,10,000 | 2,50,000 | 1,20,000 |

A sales price of ₹ 300 per unit is expected and variable expenses will amount to 60% of sales revenue. Fixed cash operating costs will amount to ₹ 40,00,000 per year. The loss of any year will be set off from the profits of subsequent years.

The company is subject to a 30 per cent tax rate. The company follows straight line method of depreciation which is to be assumed to be admissible for tax purpose also.

CALCULATE the net present value of the project for the company and advise the management to take appropriate decision.

The PV factors are to be taken as rounded figures upto 2 decimals. Use market value weights to COMPUTE overall cost of capital.

**Ans**

Cost of Equity

$K_e$ = Rf + Beta * (Rm – Rf) $K_e$ = 8% + 1.6 * (14% - 8%)

$K_e$ = 8% + (1.6 * 6%)

$K_e$ = 17.6%

1. **Cost of Redeemable Debentures (Post-Tax)** $K_d = \dfrac{\text{Int}(1-t) + \dfrac{(RV - NP)}{n}}{\dfrac{(RV+NP)}{2}}$

$$K_d = \frac{12,00,000 * (1 - 30\%) + ((1,00,00,000 - 90,00,000) / 10)}{(1,00,00,000 + 90,00,000)/ 2}$$

$K_d$ = 8,40,000 + 1,00,000
95,00,000

$K_d$ = 9.89%

2. **Cost of Redeemable Preference Shares** $K_p = \frac{PD + \frac{(RV - NP)}{n}}{\frac{(RV+NP)}{2}}$

$K_p$ = 9,37,500 + 25,000
61,25,000

$K_p$ = 15.71%

3. **Weighted Average Cost of Capital (WACC) – Book Value Method**

| Source of Capital | Market Value | Weights | After Tax Cost of Capital | WACC |
|---|---|---|---|---|
| Equity Share Capital | 1,50,00,000 | 0.5 | 17.6% | 0.088 |
| Debentures | 90,00,000 | 0.3 | 9.89% | 0.030 |
| Preference Share Capital | 60,00,000 | 0.2 | 15.71% | 0.031 |
| | **3,00,00,000** | **1.000** | | **0.149** |

**WACC = 14.9%**

4. **Computation of CFAT**

| | (year 1 to year 4) | | | | | |
|---|---|---|---|---|---|---|
| Sr. No. | Particulars / Year | 1 | 2 | 3-5 | 6-8 | 9-10 |
| A | Sale Price p.u. | 300 | 300 | 300 | 300 | 300 |
| | Sale units | 70,000 | 98,000 | 2,10,000 | 2,50,000 | 1,20,000 |
| C | Sales (A x B) | 2,10,00,000 | 2,94,00,000 | 6,30,00,000 | 7,50,00,000 | 3,60,00,000 |
| D | Variable Cost p.u. | 180 | 180 | 180 | 180 | 180 |
| E | Variable Cost (B x D) | 1,26,00,000 | 1,76,40,000 | 3,78,00,000 | 4,50,00,000 | 2,16,00,000 |
| F | Contribution (C - E) | 84,00,000 | 1,17,60,000 | 2,52,00,000 | 3,00,00,000 | 1,44,00,000 |
| G | Less: Fixed Cost | 40,00,000 | 40,00,000 | 40,00,000 | 40,00,000 | 40,00,000 |
| H | PBDT (F-G) | 44,00,000 | 77,60,000 | 2,12,00,000 | 2,60,00,000 | 1,04,00,000 |
| I | Less: Depreciation (2,50,00,000-50,00,000) / 10 | 20,00,000 | 20,00,000 | 20,00,000 | 20,00,000 | 20,00,000 |
| J | PBT | 24,00,000 | 57,60,000 | 1,92,00,000 | 2,40,00,000 | 84,00,000 |
| K | Less: Taxes @ 30% | 7,20,000 | 17,28,000 | 57,60,000 | 72,00,000 | 25,20,000 |
| L | PAT | 16,80,000 | 40,32,000 | 1,34,40,000 | 1,68,00,000 | 58,80,000 |
| M | Add: Depreciation | 20,00,000 | 20,00,000 | 20,00,000 | 20,00,000 | 20,00,000 |
| N | CFAT | 36,80,000 | 60,32,000 | 1,54,40,000 | 1,88,00,000 | 78,80,000 |

5. **Computation of NPV**

| Sr. No. | Particulars / Year | 1 | 2 | 3-5 | 6-8 | 9-10 |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| I | CFAT | 36,80,000 | 60,32,000 | 1,54,40,000 | 1,88,00,000 | 78,80,000 |
| II | PVAF @ 14.9% | 0.87 | 0.76 | (0.66+0.57+ 0.50) = 1.73 | (0.43+0.38+0.33) = 1.14 | (0.29+0.25) = 0.54 |
| III | PV of CFATs (I x II) | 32,01,600 | 45,84,320 | 2,67,11,200 | 2,14,32,000 | 42,55,200 |
| IV | Salvage + Release of WC | | | | | 80,00,000 |
| V | PVF @ 14.9% | | | | | 0.25 |
| VI | PV of Salvage (IV x V) | | | | | 20,00,000 |

PV of Inflows = 32,01,600 + 45,84,320 + 2,67,11,200 + 2,14,32,000 + 42,55,200 + 20,00,000
PV of Inflows = 6,21,84,320
PV of Outflows = Investment + Introduction of Working Capital PV of
Outflows = 2,50,00,000 + 30,00,000
PV of Outflows = 2,80,00,000
NPV = PV of Inflows – PV of Outflows
NPV = 6,21,84,320 - 2,80,00,000
**NPV = 3,41,84,320**
**The management should consider taking up the project as the Net Present Value of the Project is Positive.**

**Q.32** WACC with Market Weights | PY May 23

**Capital structure of D Ltd. as on 31stMarch, 2023 is given below:**

| Particulars | ₹ |
|---|---|
| Equity share capital (₹ 10 each) | 30,00,000 |
| 8% Preference share capital (₹ 100 each) | 10,00,000 |
| 12% Debentures (₹ 100 each) | 10,00,000 |

- Current market price of equity share is ₹ 80 per share. The company has paid dividend of ₹ 14.07 per share. Seven years ago, it paid dividend of ₹ 10 per share. Expected dividend is ₹ 16 per share.
- 8% Preference shares are redeemable at 6% premium after five years. Current market price per preference share is ₹ 104.
- 12% debentures are redeemable at 20% premium after 10 years. Flotation cost is ₹ 5 per debenture.
- The company is in 40% tax bracket.
- In order to finance an expansion plan, the company intends to borrow 15% Long-term loan of ₹ 30,00,000 from bank. This financial decision is expected to increase dividend on equity share from ₹ 16 per share to ₹ 18 per share. However, the market price of equity share is expected to decline from ₹ 80 to ₹ 72 per share, because investors' required rate of return is based on current market conditions.

Required:
(i) Determine the existing Weighted Average Cost of Capital (WACC) taking book value weights.
(ii) Compute Weighted Average Cost of Capital (WACC) after the expansion plan taking book value weights.

| Interest Rate | 1% | 2% | 3% | 4% | 5% | 6% | 7% |
|---|---|---|---|---|---|---|---|
| $FVIF_{i,5}$ | 1.051 | 1.104 | 1.159 | 1.217 | 1.276 | 1.338 | 1.403 |
| $FVIF_{i,6}$ | 1.062 | 1.126 | 1.194 | 1.265 | 1.340 | 1.419 | 1.501 |
| $FVIF_{i,7}$ | 1.072 | 1.149 | 1.230 | 1.316 | 1.407 | 1.504 | 1.606 |

**Ans** (i) (a) Growth rate in Dividends
14.07 = 10 x FVIF (i,7 years)
FVIF (i,7 years) = 1.407
FVIF (5%, 7 years) = 1.407

i = 5%  So, Growth rate in dividend= 5%

(b) **Cost of Equity**

$$K_e = \frac{D_1}{p_o} + g = \frac{16}{80} + 0.05$$

(c) **Cost of Preference Shares**

$$K_p = \frac{PD + \frac{(RV - NP)}{n}}{\frac{(RV+NP)}{2}} = \frac{8 + \frac{(106-104)}{5}}{\frac{(106+104)}{2}}$$

$K_p$ = 8.4/105 = 8%

(d) **Cost of Debt**

$$K_d = \frac{I(1-t) + \frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}} = \frac{12(1 - 0.4 + \frac{(120-95)}{5}}{\frac{(120+95)}{2}}$$

$K_d$ = (7.2+2.5)/107.5 = 9.02% = 9.02%

**Calculation of existing Weighted Average Cost of Capital (WACC)**

| Capital | Amount (₹) | Weights | Cost | WACC |
|---|---|---|---|---|
| Equity Share Capital | 30,00,000 | 0.6 | 25% | 15.00% |
| Preference Share Capital | 10,00,000 | 0.2 | 8% | 1.60% |
| Debenture | 10,00,000 | 0.2 | 9.02% | 1.80% |
| | 50,00,000 | 1 | | **18.40%** |

**Alternative presentation**

(i) **Computation of existing WACC on book value weights**

| Source (1) | Book value (₹) (2) | Weight (3) | Cost of capital (%) (4) | Product (2) x (4) |
|---|---|---|---|---|
| Equity share capital | 30,00,000 | 0.60 | 25 | 7,50,000 |
| Preference share capital | 10,00,000 | 0.20 | 8 | 80,000 |
| Debentures | 10,00,000 | 0.20 | 9.02 | 90,200 |
| **Total** | **50,00,000** | **1.00** | | **9,20,200** |

WACC = (Product / Total book value) x 100 = (9,20,200 /50,00,000) x 100 = 18.4%

(ii) **Cost of Long Term Debt** = 15% (1-0.4) = 9%

Revised $K_e = \frac{18}{72} + 0.05 = 30\%$

**Calculation of WACC after expansion taking book value weights**

| Capital | Amount | Weights | Cost | W.C |
|---|---|---|---|---|
| Equity Share Capital | 30,00,000 | 0.3750 | 30% | 11.25% |
| Preference Share Capital | 10,00,000 | 0.1250 | 8% | 1.00% |
| Debenture | 10,00,000 | 0.1250 | 9.02% | 1.13% |
| Long Term Debt | 30,00,000 | 0.3750 | 9.00% | 3.38% |
| | 80,00,000 | 1.0000 | | **16.76%** |

**Alternative presentation**

**(i) Computation of WACC on book value weights after expansion**

| Source (1) | Book value (₹) (2) | Weight (3) | Cost of capital (%) (4) | Product (2) x (4) |
|---|---|---|---|---|
| Equity share capital | 30,00,000 | 0.375 | 30 | 9,00,000 |
| Preference share capital | 10,00,000 | 0.125 | 8 | 80,000 |
| Debentures | 10,00,000 | 0.125 | 9.02 | 90,200 |
| Long term loan | 30,00,000 | 0.375 | 9 | 2,70,000 |
| **Total** | **80,00,000** | **1.00** | | **13,40,200** |

WACC = (Product / Total book value) x 100 = (13,40,200 / 80,00,000) x 100 = 16.76%

**Q.33** WACC | PY Dec 21

Book value of capital structure of B Ltd. is as follows:

| Sources | Amount |
|---|---|
| 12%, 6,000 Debentures @ ₹ 100 each | ₹ 6,00,000 |
| Retained earnings | ₹ 4,50,000 |
| 4,500 Equity shares @ ₹ 100 each | ₹ 4,50,000 |
| | **₹ 15,00,000** |

Currently, the market value of debenture is ₹ 110 per debenture and equity share is ₹ 180 per share. The expected rate of return to equity shareholder is 24% p.a. Company is paying tax @ 30%.

**Ans**

**Calculation of Cost of Capital of debentures ignoring market value:**

Cost of Debentures ($K_d$)= 12 (1 - .30) = 8.40%

**Computation of Weighted Average Cost of Capital based on Market Value Weights**

| Source of Capital | Market Value (₹) | Weights to Total Capital | After tax Cost of capital (%) | WACC (%) |
|---|---|---|---|---|
| Debentures (6,000 nos. × ₹ 110) | 6,60,000 | 0.45(approx.) | 8.40 | 3.78 |
| Equity Shares (4,500 nos. × ₹180) | 8,10,000 | 0.55(approx.) | 24.00 | 13.20 |
| | 14,70,000 | 1.00 | | 16.98 |

**Note:** Cost of Debenture and Cost of equity considered as given without considering market value. Cost of sources of capital can be computed based on the Market price and accordingly Weighted Average Cost of Capital can be calculated as below:

**Calculation of Cost of Capital for each source of capital considering market value of capital:**

(1) Cost of Equity share capital:

$$K_e = \frac{\text{Earnings}}{\text{Market Price per share}} = \frac{24\% \times 100}{180} = 13.333\%$$

(2) Cost of Debentures

$$(K_d) = \frac{I(1-t)}{NP} = \frac{12(1-0.3)}{110} = 7.636\%$$

Computation of Weighted Average Cost of Capital based on Market Value Weights

| Source of Capital | Market Value (₹) | Weights to Total Capital | After tax Cost of capital (%) | WACC (%) |
|---|---|---|---|---|
| Debentures (6,000 nos. × ₹ 110) | 6,60,000 | 0.45(approx.) | 7.636 | **3.44** (approx.) |
| Equity Shares (4,500 nos. ×₹ 180) | 8,10,000 | 0.55(approx.) | 13.333 | **7.33** (approx.) |

| | | | | |
|---|---|---|---|---|
| | 14,70,000 | 1.00 | | **10.77**(approx.) |

**Q.34** WACC | PY Jan 21

The Capital structure of PQR Ltd. is as follows:

| | ₹ |
|---|---|
| 10% Debenture | 3,00,000 |
| 12% Preference Shares | 2,50,000 |
| Equity Share (face value ₹ 10 per share) | 5,00,000 |
| | 10,50,000 |

Additional Information:

(i) ₹ 100 per debenture redeemable at par has 2% floatation cost & 10 years of maturity. The market price per debenture is ₹ 110.

(ii) ₹ 100 per preference share redeemable at par has 3% floatation cost & 10 years of maturity. The market price per preference share is ₹ 108.

(iii) Equity share has ₹ 4 floatation cost and market price per share of ₹ 25. The next year expected dividend is ₹ 2 per share with annual growth of 5%. The firm has a practice of paying all earnings in the form of dividends.

(iv) Corporate Income Tax rate is 30%.

Required:

Calculate Weighted Average Cost of Capital (WACC) using market value weights.

**Ans**

**Workings:**

1. Cost of Equity ($K_e$) $= \frac{D1}{P_0 - F} + g = \frac{2}{25-4} + 0.05 = 0.145$ (approx.)

2. Cost of Debt ($K_d$)

$$= \frac{I(1\text{-}t) + \frac{(RV\text{-}NP)}{n}}{\frac{(RV\text{-}NP)}{2}}$$

$$= \frac{10(1\text{-}0.3) + \frac{(100\text{-}98)}{10}}{\frac{(100\text{-}98)}{2}} = \frac{7+0.2}{99} = 0.073 \text{ (approx.)}$$

3. Cost of Preference Shares (Kp)

$$= \frac{PD + \frac{(RV\text{-}NP)}{n}}{\frac{(RV\text{-}NP)}{2}}$$

$$= \frac{12 + \frac{(100\text{-}97)}{10}}{\frac{(100\text{-}97)}{2}} = \frac{12+0.3}{98.5} = 0.125 \text{ (approx.)}$$

**Calculation of WACC using market value weights**

| Source of capital | Market Value | Weights | After tax cost of capital | WACC ($K_o$) |
|---|---|---|---|---|
| | (₹) | (a) | (b) | (c) = (a)×(b) |

| | | | | |
|---|---|---|---|---|
| 10% Debentures (₹ 110 × 3,000) | 3,30,000 | 0.178 | 0.073 | 0.013 |
| 12% Preference shares (₹ 108 × 2,500) | 2,70,000 | 0.146 | 0.125 | 0.018 |
| Equity shares (₹ 25 × 50,000) | 12,50,000 | 0.676 | 0.145 | 0.098 |
| | 18,50,000 | 1.00 | | **0.129** |

WACC (Ko) = 0.129 or 12.9% (approx.)

**Q.35** WACC | RTP Nov 19

KM Ltd. has the following capital structure on September 30, 2019:

| Sources of capital | (₹) |
|---|---|
| Equity Share Capital (40,00,000 Shares of ₹ 10 each) | 4,00,00,000 |
| Reserves & Surplus | 4,00,00,000 |
| 12% Preference Shares | 2,00,00,000 |
| 9% Debentures | 6,00,00,000 |
| | 16,00,00,000 |

The market price of equity share is ₹60. It is expected that the company will pay next year a dividend of ₹6 per share, which will grow at 10% forever. Assume 40% income tax rate.

You are required to COMPUTE weighted average cost of capital using market value weights.

**Ans**

(i) Cost of Equity ($K_e$) = $\frac{D1}{P_0} + g = \frac{6}{60} + 0.10 = 0.20 = 20\%$

(ii) Cost of Debentures ($K_d$) = I (1 - t) = 0.09 (1 - 0.4) = 0.054 or 5.4%

Computation of Weighted Average Cost of Capital (WACC using market value weights)

| Source of capital | Market Value of capital (₹) | Weight | Cost of capital (%) | WACC (%) |
|---|---|---|---|---|
| 9% Debentures | 6,00,00,000 | 0.1875 | 5.40 | 1.01 |
| 12% Preference Shares | 2,00,00,000 | 0.0625 | 12.00 | 0.75 |
| Equity Share Capital (₹60 × 40,00,000 shares) | 24,00,00,000 | 0.7500 | 20.00 | 15.00 |
| Total | 32,00,00,000 | 1.00 | | 16.76 |

**Q.36** WACC | MTP May 21(1)

CALCULATE the WACC by using Market value weights.
The capital structure of the company is as under:

| | (₹) |
|---|---|
| Debentures (Rs.100 per debenture) | 10,00,000 |
| Preference shares (Rs.100 per share) | 10,00,000 |
| Equity shares (Rs.10 per share) | 20,00,000 |
| | 40,00,000 |

The market prices of these securities are:
Debentures Rs. 115 per debenture
Preference shares Rs. 120 per preference share
Equity shares Rs. 265 each.
Additional information:

(1) Rs.100 per debenture redeemable at par, 10% coupon rate, 2% floatation cost, 10-year maturity.
(2) Rs.100 per preference share redeemable at par, 5% coupon rate, 2% floatation cost and 10 - year maturity.
(3) Equity shares have a floatation cost of Rs. 1 per share.
The next year expected dividend is Rs. 5 with an annual growth of 15%. The firm has the practice of paying all earnings in the form of dividend.
Corporate tax rate is 30%. Use YTM method to calculate cost of debentures and preference shares.

**Ans**

**(i) Cost of Equity ($K_e$)**

$$= \frac{D1}{P_0 - F} + g = \frac{Rs.\ 5}{Rs.265 - Re.1} + 0.15 = 0.1689 \text{ or } 16.89\%$$

**(ii) Cost of Debt ($K_d$)**

Calculation of NPV at discount rate of 5% and 7%

| Year | Cash flows (Rs.) | Discount factor @ 5% | Present Value | Discount factor @ 7% | Present Value (Rs.) |
|---|---|---|---|---|---|
| 0 | 112.7 | 1.000 | (112.7) | 1.000 | (112.7) |
| 1 to 10 | 7 | 7.722 | 54.05 | 7.024 | 49.17 |
| 10 | 100 | 0.614 | 61.40 | 0.508 | 50.80 |
| NPV | | | +2.75 | | -12.73 |

Calculation of IRR

$$IRR = 5\% + \frac{2.75}{2.75 - (-12.73)}(7\% - 5\%) = 5\% + \frac{2.75}{15.48}(7\% - 5\%) = 5.36\%$$

Cost of Debt ($K_d$) = 5.36%

**(i) Cost of Preference shares ($K_p$)**

**Calculation of NPV at discount rate of 2% and 5%**

| Year | Cashflow (Rs.) | Discount factor@ 2% | Present Value | Discount factor @ 5% | Present Value (Rs.) |
|---|---|---|---|---|---|
| 0 | 117.6 | 1.000 | (117.6) | 1.000 | (117.6) |
| 1 to 10 | 5 | 8.983 | 44.92 | 7.722 | 38.61 |
| 10 | 100 | 0.820 | 82.00 | 0.614 | 61.40 |
| NPV | | | +9.32 | | -17.59 |

Calculation of IRR 2%

$$\frac{9.32}{9.32-(-17.59)}(5\%-2\%) = 2\% + \frac{9.32}{26.91} = (5\%-2\%) = 3.04\%$$

Cost of Preference S $\frac{9.32}{9.32-(-17.59)}$ hares ($K_p$) = 3.04%

**Calculation of WACC using market value weights**

| Source of capital | Market Value | Weights | After tax cost of capital | WACC ($K_o$) |
|---|---|---|---|---|
| | (Rs.) | (a) | (b) | (c) =(a)×(b) |
| 10% Debentures (Rs.115× 10,000) | 11,50,000 | 0.021 | 0.0536 | 0.00113 |
| 5% Preference shares (Rs.120× 10,000) | 12,00,000 | 0.022 | 0.0304 | 0.00067 |

| | | | | |
|---|---|---|---|---|
| Equity shares (Rs.265 × 2,00,000) | 5,30,00,000 | 0.957 | 0.1689 | 0.16164 |
| | 5,53,50,000 | 1.000 | | 0.16344 |

WACC (Ko) = 0.16344 or 16.344%

**Q.37** WACC | RTP May 22

The information relating to book value (BV) and market value (MV) weights of Ex Limited is given below:

| Sources | Book Value (₹) | Market Value (₹) |
|---|---|---|
| Equity shares | 2,40,00,000 | 4,00,00,000 |
| Retained earnings | 60,00,000 | - |
| Preference shares | 72,00,000 | 67,50,000 |
| Debentures | 18,00,000 | 20,80,000 |

Additional information:

I. Equity shares are quoted at ₹ 130 per share and a new issue priced at ₹ 125 per share will be fully subscribed; flotation costs will be ₹ 5 per share on face value.

II. During the previous 5 years, dividends have steadily increased from ₹ 10 to ₹ 16.105 per share. Dividend at the end of the current year is expected to be ₹ 17.716 per share.

III. 15% Preference shares with face value of ₹ 100 would realise ₹ 105 per share.

IV. The company proposes to issue 11-year 15% debentures but the yield on debentures of similar maturity and risk class is 16%; flotation cost is 2% on face value.

V. Corporate tax rate is 30%.

You are required to DETERMINE the weighted average cost of capital of Ex Limited using both the weights.

**Ans.** (i) Cost of Equity ($K_e$) $= \frac{D1}{P_0\text{-}F} + g = \frac{17.716}{125-5} + 0.10^*$

$K_e = 0.2476$

*Calculation of g:

$10\,(1+g)^5 = 10\,(1+g)^5 = 16.105$

Or, $(1+g)^5 = \frac{16.105}{10} = 1.6105$

Table (FVIF) suggests that ₹ 1 compounds to ₹ 1.6105 in 5 years at the compound rate of 10 percent. Therefore, g is 10 per cent.

(ii) Cost of Retained Earnings (Kr) $= \frac{D_1}{P_0} + g = \frac{17.716}{130} + 0.10 = 0.2363$

(iii) Cost of Preference Shares ($K_p$) $= \frac{PD}{P_0} = \frac{15}{105} = 0.1429$

(iv) Cost of Debentures ($K_d$) $= \frac{I(1\text{-}t)\left(\frac{Rv\text{-}NP}{n}\right)}{\frac{RV+NP}{2}} = \frac{15(1\text{-}0.30)\left(\frac{100\text{-}91.75}{11 years}\right)}{\frac{100+91.75}{2}}$

$= \frac{15x0.70+0.75}{95.875} = \frac{11.25}{95.875} = 0.1173$

*Since yield on similar type of debentures is 16 per cent, the company would be required to offer debentures at discount.

Market price of debentures (approximation method) = ₹ 15 ÷ 0.16 = ₹ 93.75
Sale proceeds from debentures = ₹ 93.75 – ₹ 2 (i.e., floatation cost) = ₹91.75
Market value (P0) of debentures can also be found out using the present value method:

P0 = Annual Interest × PVIFA (16%, 11 years) + Redemption value × PVIF (16%,11 years)
P0 = ₹ 15 × 5.0287 + ₹ 100 × 0.1954
P0 = ₹ 75.4305 + ₹ 19.54 = ₹ 94.9705
Net Proceeds = ₹ 94.9705 – 2% of ₹ 100 = ₹ 92.9705
Accordingly, the cost of debt can be calculated

**Total Cost of capital [BV weights and MV weights]**

**(Amount in (₹) lakh)**

| Source of capital | Weights | | Specific Cost (K) | Total cost | |
|---|---|---|---|---|---|
| | BV | MV | | (BV × K) | (MV × K) |
| Equity Shares | 240 | 320** | 0.2476 | 59.4240 | 79.2320 |
| Retained Earnings | 60 | 80** | 0.2363 | 14.1780 | 18.9040 |
| Preference Shares | 72 | 67.50 | 0.1429 | 10.2888 | 9.6458 |
| Debentures | 18 | 20.80 | 0.1173 | 2.1114 | 2.4398 |
| Total | 390 | 488.30 | | 86.0022 | 110.2216 |

**Market Value of equity has been apportioned in the ratio of Book Value of equity and retained earnings i.e., 240:60 or 4:1.

**Weighted Average Cost of Capital (WACC):**

Using Book Value $= \frac{86.0022}{390} = 0.2205$ or 22.05%

Using Market Value $= \frac{110.2216}{488.30} = 0.2257$ or 22.57%

**Q.38** WACC | RTP May 19

As a financial analyst of a large electronics company, you are required to DETERMINE the weighted average cost of capital of the company using (a) book value weights and (b) market value weights. The following information is available for your perusal.

The Company's present book value capital structure is:

| | (₹) |
|---|---|
| Debentures (₹100 per debenture) | 8,00,000 |
| Preference shares (₹100 per share) | 2,00,000 |
| Equity shares (₹10 per share) | 10,00,000 |
| | 20,00,000 |

All these securities are traded in the capital markets. Recent prices are:
Debentures, ₹110 per debenture, Preference shares, ₹120 per share, and Equity shares, ₹ 22 per share
Anticipated external financing opportunities are:
(i) ₹ 100 per debenture redeemable at par; 10 year maturity, 11 per cent coupon rate, 4 per cent flotation costs, sale price, ₹ 100

(ii) ₹ 100 preference share redeemable at par; 10 year maturity, 12 per cent dividend rate, 5 per cent flotation costs, sale price, ₹100.

(iii) Equity shares: ₹ 2 per share flotation costs, sale price = ₹ 22.

In addition, the dividend expected on the equity share at the end of the year is ₹ 2 per share, the anticipated growth rate in dividends is 7 per cent and the firm has the practice of paying all its earnings in the form of dividends. The corporate tax rate is 35 per cent.

**Ans.**

(i) Cost Debt ($K_d$) = $$\frac{\text{Interest}(1-t)+\frac{(RV-NP)}{N}}{\frac{RV-NP}{2}} = \frac{11(1-0.35)+\frac{(100-96)}{10\text{years}}}{\frac{100-96}{2}}$$

$$= \frac{7.15+0.4}{98} = 0.077 \text{ or } 7.70\%$$

(ii) Cost of Preference Shares ($K_p$) = $$\frac{PD+\frac{(RV-NP)}{N}}{\frac{RV-NP}{2}} = \frac{12+\frac{(100-95)}{10\text{years}}}{\frac{100-95}{2}}$$

$$= \frac{12+0.5}{97.5} = 0.1282 \text{ or } 12.82\%$$

(iii) Cost of Equity shares ($K_e$) $\frac{D_1}{P_0}+G = \frac{2}{22-2}+0.07 = 0.17$ or 17%

I – Interest, t – Tax, RV- Redeemable value, NP- Net proceeds, N- No. of years, PD- Preference dividend, D1- Expected Dividend, P0- Price of share (net)

Using these specific costs we can calculate WACC on the basis of book value and market value weights as follows:

(a) Weighted Average Cost of Capital (K0) based on Book value weights

| Source of capital | Book value(₹) | Weights | Specific cost (%) | WACC (%) |
|---|---|---|---|---|
| Debentures | 8,00,000 | 0.40 | 7.70 | 3.08 |
| Preferences shares | 2,00,000 | 0.10 | 12.82 | 1.28 |
| Equity shares | 10,00,000 | 0.50 | 17.00 | 8.50 |
| | 20,00,000 | 1.00 | | 12.86 |

(b) Weighted Average Cost of Capital ($K_0$) based on market value weights:

| Source of capital | Market value(₹ ) | Weights | Specific cost (%) | WACC (%) |
|---|---|---|---|---|
| Debenture $\frac{8,00,000}{100}$ x110 | 8,80,000 | 0.265 | 7.70 | 2.04 |
| Preferences shares $\frac{2,00,000}{100}$ x120 | 2,40,000 | 0.072 | 12.82 | 0.92 |
| Equity shares | 22,00,000 | 0.663 | 17.00 | 11.27 |

| | | | | |
|---|---|---|---|---|
| $\frac{10,00,000}{10}$ x 22 | | | | |
| | 33,20,000 | 1.000 | | 14.23 |

**Q.39** WACC | MTP May 22(2)

The capital structure of RV Limited as on 31st March, 2022 as per its Balance Sheet is as follows:

| **Particulars** | ₹ |
|---|---|
| Equity shares of ₹ 10 each | 25,00,000 |
| 10% Preference shares of ₹ 100 each | 5,00,000 |
| Retained earnings | 5,00,000 |
| 13% debentures of ₹ 100 each | 20,00,000 |

The market price of equity shares is ₹ 50 per share. Expected dividend on equity shares is ₹ 3 per share. The dividend per share is expected to grow at the rate of 8%.
Preference shares are redeemable after eight years and the current market price is ₹ 80 per share.
Debentures are redeemable after five years and are currently selling at ₹ 90 per debenture.
The tax rate applicable to the company is 35%.
CALCULATE weighted average cost of capital using:
(i) Book value proportions
(ii) Market value proportions

**Ans.** (i) Cost of Equity ($K_e$)

$$\frac{D1}{P}+g = \frac{3}{50} + 0.08 = 0.14 \text{ i.e. } 14\%$$

(ii) Cost of preference shares ($K_p$)

$$\frac{D+\frac{RV-NP}{n}}{\frac{RV+NP}{2}} = \frac{10+\frac{(100-80)}{8}}{\frac{100+80}{2}} = \frac{12.5}{90} = 0.1389 = 13.89\%$$

(iii) Cost of debenture ($K_d$)

$$\frac{I(1-t)+\frac{RV-NP}{n}}{\frac{RV+NP}{2}} = \frac{13(1-0.35)+\frac{(100-90)}{5}}{\frac{100+90}{2}} = \frac{8.45+2}{95} = 0.11 \text{ i.e. } 11\%$$

Or

$$\left[\frac{I+\frac{RV-NP}{n}}{\frac{RV+NP}{2}}\right](1-t) = \left[\frac{13+\frac{(100-90)}{5}}{\frac{100+90}{2}}\right](1-0.35) = 0.1026 \text{ i.e. } 10.26\%$$

Weighted Average cost of capital (Book Value)

| | **Amount (₹)** | **Weight (W)** | **Cost (K)** | **W x K** |
|---|---|---|---|---|
| Equity shares | 25,00,000 | 0.4546 | 0.14 | 0.0636 |

| | | | | |
|---|---|---|---|---|
| Preference shares | 5,00,000 | 0.0909 | 0.1389 | 0.0126 |
| Retained Earnings | 5,00,000 | 0.0909 | 0.14 | 0.0127 |
| Debentures | 20,00,000 | 0.3636 | 0.1026 | 0.0373 |
| | 55,00,000 | | | 0.1262 |

Or (if $K_d$ is 11%) the WACC = 0.1289
Thus, WACC (Book value based) = 12.62% or 12.89%

Weighted Average cost of capital (Market Value)

| | Amount (₹) | Weight (W) | Cost (K) | W x K |
|---|---|---|---|---|
| Equity shares | 1,25,00,000 | 0.85 | 0.14 | 0.119 |
| Preference shares | 4,00,000 | 0.028 | 0.1389 | 0.0039 |
| Debentures | 18,00,000 | 0.122 | 0.1026 | 0.0125 |
| | 1,47,00,000 | | | 0.1354 |

Or (if $K_d$ is 11%) the WACC = 0.1363
Thus, WACC (Market value based) = 13.54% or 13.63%

**Q.40** WACC | RTP May 23

Amrit Corporation has the following book value capital structure:

| | |
|---|---|
| Equity Capital (50 lakh shares of ₹ 10 each). | ₹ 5,00,00000 |
| 15% Preference share (50,000 shares ₹ 100 each) | ₹ 50,00,000 |
| Retained earnings | ₹ 4,00,00,000 |
| Debentures 14% (2,50,000 debentures ₹ 100 each) | ₹ 2,50,00,000 |
| Term loan 13% | ₹ 4,00,00000 |

The companies last year earnings per share was ₹ 5, and it maintains a dividend pay-out ratio of 60% and returns on equity is 10%. The market price per share is ₹ 20.8. Preference share redeemable after 10 years is currently selling for ₹ 90 per share. Debentures redeemable after 6 years are currently selling for ₹ 75 per debenture. The income tax rate is 40%.

(a) CALCULATE the Weighted Average Cost of Capital (WACC) using market value proportions.

(b) DETERMINE the Marginal Cost of Capital (MACC) if it needs ₹ 5,00,00000 next year assuming the amount will be raised by 60% equity, 20% debt and 20% retained earnings. Equity issues will fetch a net price of ₹ 14 and cost of debt will be 13% before tax up to ₹ 40,00,000 and beyond ₹ 40,00,000 it will be 15% before tax.

**Ans.** (a) Calculation of Cost of Equity

(i) $D_0$ = ₹ 5x 60%
$D_0$ = ₹ 3
g = b x r
= (1-0.6) x 10% = 4%
D1 = D0 x (1 + g)
= 3 x (1 + 4%)
= 3 x 1.04 = 3.12

$$K_e = \frac{D_1}{P_0} + g$$

$$K_e = \frac{3.12}{20.8} + 0.04$$

(ii) Calculation of Cost of Preference Shares

N =10 years
NP = ₹ 90
PD = ₹ 15
RV = ₹ 100

$$K_p = \frac{= PD + (RV - NP) / N}{(RV + N P)} \times 100$$

$$K_p = \frac{15 + (100 - 90) / 10}{(100 + 90) / 2} \times 100$$

$K_p$ = 16/95 x 100
$K_p$= 16.84%

(iii) Calculation of Cost of Debentures
N = 6 years
NP = ₹ 75
Interest = ₹ 14
RV = ₹ 100
T = 40%

$$K_d = \frac{int(1 - t) + (RV - N P) / N}{(RV + NP) / 2} \times 100$$

$$K_d = \frac{14 \times (1 - 0.4) + (100 - 75) / 6}{(100 + 75) / 2} \times 100$$

$$K_d = \frac{8.4 - 4.17}{87.5} \times 100$$

$K_d$ =14.37%

(iv) Cost of Term Loan
$K_d$ = Interest rate (1-t)
$K_d$ = 13% (1-40%)
$K_d$ = 7.8%

Calculation of Weighted Average Cost of Capital (WACC) (using market weights)

| Capital | Cost of Capital | Market Value | | Market Value Weights | Product (Cost x weights) |
|---|---|---|---|---|---|
| Equity | 19.00% | 20.8 x 50,00,000 | ₹10,40,00,000 | 0.6218 | 11.81% |
| Preference Shares | 16.84% | 90 x 50,000 | ₹ 45,00,000 | 0.0269 | 0.45% |
| Debentures | 14.37% | 75 x 2,50,000 | ₹ 1,87,50,000 | 0.1121 | 1.61% |
| Term Loan | 7.80% | | ₹ 4,00,00,000 | 0.2392 | 1.87% |
| Total | | | **₹16,72,50,000** | **1** | **15.74%** |

**WACC= 15.74%**

(b) Calculation of Marginal Cost of Capital (MACC)

The required capital of ₹ 50,000,000 will be raised as follows:
Equity = 60% of ₹ 50,000,000 = ₹ 30,000,000

Deby = 20% of ₹ 50,000,000 = ₹10,000,000
Retained Earnings= 20% of ₹ 50,000,000 = ₹ 10,000,000

Marginal Cost of Equity = $\frac{3.12}{1.4} + 0.04$

= 26.28%

Marginal Cost of Debt

Cost of Debt (before tax) = $\frac{13\% \text{ of } 40,00,000 + 15\% \text{ of } 60,00,000}{1,00,00,000}$

= $\frac{5,20,000 + 9,00,000}{1,00,00,000}$ = 14.2

Cost of Debt (after tax). = 14.2% (1-t)
= 14.2% (1-0.4)
= 8.52%

Calculation of marginal cost of capital

| Capital | Cost of Capital | Value | Weights | Product (Cost x weights) |
|---|---|---|---|---|
| Equity | 26.28% | ₹ 3,00,00,000 | 0.6 | 15.77% |
| Reserves | 26.28% | ₹ 1,00,00,000 | 0.2 | 5.26% |
| Debt | 8.52% | ₹ 1,00,00,000 | 0.2 | 1.70% |
| Total | | **₹ 5,00,00,000** | **1** | **22.73%** |

Marginal Cost of Capital (MACC) = 22.73%

CALCULATE the WACC using the following data by using:
(a) Book value weights
(b) Market value weights

**Q.41** WACC | RTP Nov 20

The capital structure of the company is as under:
(a) Book value weights
(b) Market value weights
The capital structure of the company is as under:

| Particulars | (₹) |
|---|---|
| Debentures (₹ 100 per debenture) | 5,00,000 |
| Preference shares (₹ 100 per share) | 5,00,000 |
| Equity shares (₹ 10 per share) | 10,00,000 |
| | 20,00,000 |

The market prices of these securities are:
Debentures ₹ 105 per debenture
Preference shares ₹ 110 per preference share
Equity shares ₹ 24 each.
Additional information:
(i) ₹ 100 per debenture redeemable at par, 10% coupon rate, 4% floatation costs, 10-year maturity.
(ii) ₹ 100 per preference share redeemable at par, 5% coupon rate, 2% floatation cost and 10-year maturity.
(iii) Equity shares has ₹ 4 floatation cost and market price ₹ 24 per share.
The next year expected dividend is ₹ 1 with annual growth of 5%. The firm has practice of paying all earnings in the form of dividend.

Corporate tax rate is 30%. Use YTM method to calculate cost of debentures and preference shares.

**Ans.**

**(i) Cost of Equity ($K_e$)**

$$= \frac{D_1}{P0-F} + g = \quad v + 0.05 = 0.1 \text{ or } 10\%$$

**(ii) Cost of Debt ($K_d$)**

Current market price (P0) – floatation cost = I(1-t) × PVAF(r,10) + RV × PVIF(r,10)

₹ 105 – 4% of ₹ 105 = ₹ 10 (1-0.3) × PVAF (r,10) + ₹ 100 × PVIF (r,10)

Calculation of NPV at discount rate of 5% and 7%

| Year | Cash flows (₹) | Discount factor @5% | Present Value | Discount factor @7% | Present Value (₹) |
|---|---|---|---|---|---|
| 0 | 100.8 | 1.000 | (100.8) | 1.000 | (100.8) |
| 1 to 10 | 7 | 7.722 | 54.05 | 7.024 | 49.17 |
| 10 | 100 | 0.614 | 61.40 | 0.508 | 50.80 |
| NPV | | | +14.65 | | -0.83 |

$$IRR = 5\% + \frac{14.65}{14.65-(-0.83)}(7\%-5\%) = 5\% + \frac{14.65}{15.48}(7\%-5\%) = 6.89\%$$

Cost of Debt ($K_d$) = 6.89%

**(iii) Cost of Preference shares ($K_p$)**

Current market price (P0) – floatation cost = PD × PVAF(r,10) + RV × PVIF(r,10)

₹ 110 – 2% of ₹ 110 = ₹ 5 × PVAF (r,10) + ₹ 100 × PVIF (r,10)

Calculation of NPV at discount rate of 3% and 5%

| Year | Cash flows | Discount factor @ | Present Value | Discount factor @ | Present Value (₹) |
|---|---|---|---|---|---|
| 0 | 107.8 | 1.000 | (107.8) | 1.000 | (107.8) |
| 1 to 10 | 5 | 8.530 | 42.65 | 7.722 | 38.61 |
| 10 | 100 | 0.744 | 74.40 | 0.614 | 61.40 |
| NPV | | | +9.25 | | -7.79 |

Calculation of IRR

$$=3\% + \frac{9.25}{9.25-(-7.79)}(5\%-3\%) = 3\% \frac{9.25}{17.04}(5\%-3\%) = 4.08\%$$

Cost of Preference Shares ($K_p$) = 4.08%

(a) Calculation of WACC using book value weights

| Source of capital | Book Value (₹) | Weights (a) | After tax cost of capital (b) | WACC ($K_o$) (c) = (a)×(b) |
|---|---|---|---|---|
| 10% Debentures | 5,00,000 | 0.25 | 0.0689 | 0.01723 |
| 5% Preference shares | 5,00,000 | 0.25 | 0.0408 | 0.0102 |
| Equity shares | 10,00,000 | 0.50 | 0.10 | 0.05000 |
| | 20,00,000 | 1.00 | | 0.07743 |

WACC ($K_o$) = 0.07743 or 7.74%.

(c) Calculation of WACC using market value weights

| Source of capital | Market Value | Weights | After tax cost of capital | WACC ($K_o$) |
|---|---|---|---|---|
| | (₹) | (a) | (b) | (c) = (a)×(b) |
| 10% Debentures (₹ 105× 5,000) | 5,25,000 | 0.151 | 0.0689 | 0.0104 |
| 5% Preference shares | 5,50,000 | 0.158 | 0.0408 | 0.0064 |
| (₹ 110× 5,000) Equity shares (₹ 24× 1,00,000) | 24,00,000 | 0.691 | 0.10 | 0.0691 |
| | 34,75,000 | 1.000 | | 0.0859 |

WACC ($K_o$) = 0.0859 or 8.59%

**Q.42** WACC | ICAI MAT

Gamma Limited has 5,00,000,₹ 1 ordinary shares whose current ex-dividend market price is ₹ 1.50 per share. The company has just paid a dividend of 27 paise per share, and dividends are expected to continue at this level for some time. If the company has no debt capital, COMPUTE the weighted average cost of capital?

**Ans.** Market value of equity, E = 5,00,000 shares x ₹1.50 = ₹7,50,000

Market value of debt, D = Nil

Cost of equity capital, $K_e = \frac{D_1}{P_0} = \frac{0.27}{1.50} = 0.18$

Since there is no debt capital, WACC = $K_e$ = 18 per cent.

**Q.43** WACC | ICAI MAT

The following details are provided by the GPS Limited:

| | (₹) |
|---|---|
| Equity Share Capital | 65,00,000 |
| 12% Preference Share Capital | 12,00,000 |
| 15% Redeemable Debentures | 20,00,000 |
| 10% Convertible Debentures | 8,00,000 |

The cost of equity capital for the company is 16.30% and income tax rate for the company is 30%.

You are required to CALCULATE the Weighted Average Cost of Capital (WACC) of the company.

**Ans.** **Calculation of Weighted Average Cost of Capital (WACC)**

| Source | (₹) | Weight | Cost of Capital after tax | WACC |
|---|---|---|---|---|
| Equity Capital | 65,00,000 | 0.619 | 0.163 | 0.1009 |
| 12% Preference Capital | 12,00,000 | 0.114 | 0.120 | 0.0137 |
| 15% RedeemableDebentures | 20,00,000 | 0.190 | 0.105* | 0.020 |
| 10% ConvertibleDebentures | 8,00,000 | 0.076 | 0.070** | 0.0053 |
| Total | 1,05,00,000 | 1.0000 | | 0.1399 |

* Cost of 15% Redeemable Debentures (after tax) = 15 (1 – 0.30)
= 10.5% or0.105

** Cost of 10% Convertible Debentures (after tax) = 10 (1 – 0.30)= 7% or 0.070 Weighted Average Cost of Capital (WACC) = 0.1399 = 13.99%

(Note: In the above solution, the Cost of Debentures has been computed without considering the impact of special features i.e. redeemability and convertibility in absence of requisite information.)

**Q.44** Cost of Equity | ICAI MAT

ABC Company's equity share is quoted in the market at ₹25 per share currently. The company pays a dividend of ₹ 2 per share and the investor's market expects a growth rate of 6% per year.

You are required to:

(i) CALCULATE the company's cost of equity capital.

(ii) If the company issues 10% debentures of face value of ₹100 each and realises ₹ 96 per debenture while the debentures are redeemable after12 years at a premium of 12%, CALCULATE cost of debenture using YTM?

Assume Tax Rate to be 50%.

**Ans**

**(i) Cost of Equity Capital ($K_e$):**

$$K_e = \frac{\text{Expected dividend pershare}(D_1)}{\text{Marketprice pershare}(P_0)} + \text{Growth rate}(g)$$

$$= \frac{2}{25} - \frac{1.06}{25} + 0.06 = 0.1448 \text{ or } 14.48\%$$

**(ii) Cost of Debenture ($K_d$):**

Using Present Value method (YTM)

**Identification of relevant cash flows**

| Year | Cash flows |
|---|---|
| 0 | Current market price (P0) = ₹96 |
| 1 to 12 | Interest net of tax [I(1-t)] = 10% of ₹100 (1 – 0.5) = ₹5 |
| 12 | Redemption value (RV) = ₹100 (1.12) = ₹112 |

**Calculation of Net Present Values (NPV) at two discount rates**

| Year | Cash flows(₹) | Discount factor @ 5%(L) | Present Value(₹) | Discount factor @ 10% (H) | Present Value(₹) |
|---|---|---|---|---|---|
| 0 | (96) | 1.000 | (96.00) | 1.000 | (96.00) |
| 1 to 12 | 5 | 8.863 | 44.32 | 6.814 | 34.07 |
| 12 | 112 | 0.557 | 62.38 | 0.319 | 35.73 |
| NPV | | | +10.7 | | -26.2 |

**Calculation of IRR**

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H-L)$$

$$= 5\% + \frac{10.7}{10.7 - (-26.2)}(10\%-5\%) = 5\% + \frac{53.5}{36.9} = 6.45\%$$

Therefore, $K_d$ = 6.45%

**Q.45** Cost of Debt / Equity | ICAI MAT

Masco Limited wishes to raise additional finance of ₹ 10 lakhs for meeting its investment plans. It has ₹ 2,10,000 in the form of retained earnings available for investment purposes. Further details are as following:

You are required to:

| | | |
|---|---|---|
| (1) | Debt / Equity mix | 3:7 |
| (2) | Cost of debt: | |
| | Upto` 1,80,000 | 10% (before tax) |
| | Beyond ` 1,80,000 | 16% (before tax) |
| (3) | Earnings per share | ` 4 |
| (4) | Dividend pay out | 50% of earnings |
| (5) | Expected growth rate of dividend | 10% |
| (6) | Current market price per share | ` 44 |
| (7) | Tax rate | 50% |

(a) DETERMINE the pattern for raising the additional finance.

(b) DETERMINE the post-tax average cost of additional debt.

(c) DETERMINE the cost of retained earnings and cost of equity.

(d) COMPUTE the overall weighted average after tax cost of additional finance.

**Ans** (a) Pattern for raising the additional finance:

Equity 70% of ₹10,00,000 = ₹7,00,000
Debt 30% of ₹10,00,000 = ₹3,00,000

The capital structure after raising additional finance:

| | | (₹) |
|---|---|---|
| **Shareholders' funds** | | |
| Equity Capital | (₹7,00,000 -₹2,10,000) | 4,90,000 |
| Retained earnings | | 2,10,000 |
| Debt (Interest at 10% p.a.) | | 1,80,000 |
| (Interest at 16% p.a.) | (₹3,00,000 -₹1,80,000) | 1,20,000 |
| Total Funds | | 10,00,000 |

(b) Determination of post-tax average cost of additional debt: Kd = I (1 – t)
Where,
I = Interest Rate
t = Corporate tax-rate
On ₹ 1,80,000 =10% (1 – 0.5)=5% or 0.05
On ₹ 1,20,000 =16% (1 – 0.5)=8% or 0.08
Average Cost of Debt

$$= \frac{(1,80,000 \times 0.05) + (1,20,000 \times 0.08)}{3,00,000} \times 100 = 6.2\%$$

(c) Determination of cost of retained earnings and cost of equity by applying Dividend growth model:

$$K_e \text{ or } K_r = \frac{D_1}{P_0} + g = \frac{D_0 (1+g)}{P_0} + g$$

Where,

$D_0$ = Dividend paid = 50% of EPS = 50% × ₹ 4 = ₹ 2
g = Growth rate =10%
$P_0$ = Current market price per share = ₹44

So, $K_e$ or $K_r = \frac{2(1+0.10)}{44} + 0.10 = \frac{2.2}{44} + 0.10 = 0.05 + 0.10 = 0.15$ or 15%

(d) Computation of overall weighted average after tax cost of additional finance:

| Particulars | Amount (₹) | Weights | Cost of funds | Weighted Cost (%) |
|---|---|---|---|---|
| Equity(including retained earnings) | 7,00,000 | 0.70 | 15% | 10.5 |
| Debt | 3,00,000 | 0.30 | 6.2% | 1.86 |
| WACC | 10,00,000 | | | **12.36** |

**Q.46** Cost of Capital | ICAI MAT

DETERMINE the cost of capital of Best Luck Limited using the book value (BV) and market value (MV) weights from the following information:

| Sources | Book Value(₹) | Market Value(₹) |
|---|---|---|
| Equity shares | 1,20,00,000 | 2,00,00,000 |
| Retained earnings | 30,00,000 | - |
| Preference shares | 36,00,000 | 33,75,000 |
| Debentures | 9,00,000 | 10,40,000 |

Additional information:

I. Equity: Equity shares are quoted at ₹130 per share and a new issue priced at ₹125 per share will be fully subscribed; flotation costs will be ₹ 5 per share.

II. Dividend: During the previous 5 years, dividends have steadily increased from ₹ 10.60 to ₹ 14.19 per share. Dividend at the end of the current year is expected to be ₹ 15 per share.

III. Preference shares: 15% Preference shares with face value of ₹ 100 would realise₹105 per share.

IV. Debentures: The company proposes to issue 11-year 15% debentures but the yield on debentures of similar maturity and risk class is 16%; flotation cost is 2%.

V. Tax: Corporate tax rate is 35%.Ignore dividend tax.

Floatation cost would be calculated on face value.

**Ans**

(i) Cost of Equity $(K_e) = \frac{D_1}{P_O - F} + g \quad \frac{15}{125-5} + 0.06$ *

$K_e$ = 0.125 + 0.06 = 0.185

*Calculation of g:

₹ $10.6(1+g)^5$ = ₹ 14.19

Or, $(1+g)^5 = \frac{14.19}{10.6} = 1.338$

Table (FVIF) suggests that ₹1 compounds to ₹1.338 in 5 years at the compound rate of 6 percent. Therefore, g is 6 per cent.

(ii) Cost of Retained Earnings $(K_r) = \frac{D_1}{P_O} + g = \frac{15}{125} + 0.06 = 0.18$

(iii) Cost of Preference Shares ($K_P$) = $\frac{PD}{P_O} = \frac{15}{105} = 0.1429$

(iv) Cost of Debentures ($K_d$) = $\frac{I(1-t)+\frac{RV-NP}{n}}{\frac{RV+NP}{n}}$ = $\frac{15(1-0.35)+\frac{100-91.75}{11 years}}{\frac{100+91.75}{2}}$

= $\frac{15\times0.65+0.75}{95.875} = \frac{10.5}{95.875} = 0.1095$

*Since yield on similar type of debentures is 16 per cent, the company would be required to offer debentures at discount.

Market price of debentures (approximation method)

= ₹ 15 ÷ 0.16 = ₹ 93.75

Sale proceeds from debentures = ₹93.75 – ₹ 2 (i.e., floatation cost) = ₹91.75

Market value (P0) of debentures can also be found out using the present value method:

$P_0$ = Annual Interest × PVIFA (16%, 11 years) + Redemption value × PVIF (16%, 11 years)

$P_0$ = ₹15 × 5.029 + ₹100 × 0.195 $P_0$ = ₹75.435 + ₹19.5 = ₹ 94.935

Net Proceeds = ₹94.935 – 2% of ₹100 = ₹ 92.935 Accordingly, the cost of debt can be calculated

**Total Cost of capital [BV weights and MV weights]**

**(Amount in (₹) lakh)**

| Source of capital | Weights | | Specific Cost (K) | Total cost | |
|---|---|---|---|---|---|
| | BV | MV | | (BV × K) | (MV × K) |
| Equity Shares | 120 | 160* | 0.1850 | 22.2 | 29.6 |
| Retained Earnings | 30 | 40* | 0.1800 | 5.4 | 7.2 |
| Preference Shares | 36 | 33.75 | 0.1429 | 5.14 | 4.82 |
| Debentures | 9 | 10.4 | 0.1095 | 0.986 | 1.139 |
| Total | 195 | 244.15 | | 33.73 | 42.76 |

*Market Value of equity has been apportioned in the ratio of Book Value of equity and retained earnings i.e., 120:30 or 4:1.

**Weighted Average Cost of Capital (WACC):**

Using Book Value = $\frac{33.73}{195}$ = 0.1729 or 17.29%

Using Market Value = $\frac{42.76}{244.15}$ = 0.1751 or 17.51%

**Q.47** Cost of Debt / Preference | ICAI MAT

A company issues:

- 15% convertible debentures of ₹ 100 each at par with a maturity period of 6 years. On maturity, each debenture will be converted into 2 equity shares of the company. The risk-free rate of return is 10%, market risk premium is 18% and beta of the company is 1.25. The company has paid dividend of ₹ 12.76 per share. Five years ago, it paid dividend of₹10 per share. Flotation cost is 5% of issue amount.
- 5% preference shares of ₹ 100 each at premium of 10%. These shares are redeemable after 10 years at par. Flotation cost is 6% of issue amount.

Assuming corporate tax rate is 40%.

(i) CALCULATE the cost of convertible debentures using the approximation method.

(ii) Use YTM method to CALCULATE cost of preference shares.

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| PVIF 0.03, t | 0.971 | 0.943 | 0.915 | 0.888 | 0.863 | 0.837 | 0.813 | 0.789 | 0.766 | 0.744 |
| PVIF 0.05, t | 0.952 | 0.907 | 0.864 | 0.823 | 0.784 | 0.746 | 0.711 | 0.677 | 0.645 | 0.614 |
| PVIFA 0.03, t | 0.971 | 1.913 | 2.829 | 3.717 | 4.580 | 5.417 | 6.230 | 7.020 | 7.786 | 8.530 |
| PVIFA 0.05, t | 0.952 | 1.859 | 2.723 | 3.546 | 4.329 | 5.076 | 5.786 | 6.463 | 7.108 | 7.722 |

| Interest rate | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% |
|---|---|---|---|---|---|---|---|---|---|
| FVIF i, 5 | 1.051 | 1.104 | 1.159 | 1.217 | 1.276 | 1.338 | 1.403 | 1.469 | 1.539 |
| FVIF i, 6 | 1.062 | 1.126 | 1.194 | 1.265 | 1.340 | 1.419 | 1.501 | 1.587 | 1.677 |
| FVIF i, 7 | 1.072 | 1.149 | 1.230 | 1.316 | 1.407 | 1.504 | 1.606 | 1.714 | 1.828 |

**Ans**

(i) Calculation of Cost of Convertible Debentures:

Given that,

$R_F$ = 10%

$R_m - R_f$ = 18%

B = 1.25

$D_0$ = 12.76

$D_5$ = ₹ 10

Flotation Cost = 5%

**Using CAPM**,

$K_e = R_f + \beta (R_m - R_f)$

= 10%+1.25 (18%)

= 32.50%

Calculation of growth rate in dividend

$12.76 = 10 (1+g)^5$

$1.276 = (1+g)^5$

$(1+5\%)^5 = 1.276$ from FV Table

$g = 5\%$

Price of share after 6 years = $\frac{D_7}{k-g} = \frac{12.76(1.05)^7}{0.325 - 0.05}$

$P_6 = \frac{12.76 \times 1.407}{0.275}$

$P_6$ = 65.28

Redemption Value of Debenture (RV) = 65.28 × 2 = 130.56 (RV)

NP = 95

n = 6

$K_d = \frac{INT(1 - t) + \frac{RV - NP}{n}}{\frac{RV - NP}{2}} \times 100$

$= \frac{15(1 - 0.4) + \frac{(130.56-95)}{6}}{\frac{(130.56-95)}{2}} \times 100$

$= \frac{9 + 5.93}{112.78} \times 100$

$K_d$ = 13.24%

(ii) Calculation of Cost of Preference Shares:

Net Proceeds = 100 (1.1) - 6% of 100 (1.1)
= 110 - 6.60
= 103.40

Redemption Value= 100

| Year | Cash Flows (₹) | PVF @ 3% | PV (₹) | PVF @ 5% | PV (₹) |
|---|---|---|---|---|---|
| 0 | 103.40 | 1 | 103.40 | 1 | 103.40 |
| 1-10 | -5 | 8.530 | -42.65 | 7.722 | -38.61 |
| 10 | -100 | 0.744 | -74.40 | 0.614 | -61.40 |
| | | | **-13.65** | | **3.39** |

$$K_p = 3\% + \frac{5\% - 3\%}{[3.39 - (-13.65)]}$$

$$= 3\% + \frac{2\%}{17.04} \times 13.65$$

$K_p$ = 4.6021%

# 6 CHAPTER DIVIDEND DECISIONS

**Q.1** Dividend Payout | PY May 23

Following information are given for a company:

| | |
|---|---|
| Earnings per share | ₹ 10 |
| P/E ratio | 12.5 |
| Rate of return on investment | 12% |
| Market price per share as per Walter's Model | ₹ 130 |

You are required to calculate: (i)

Dividend payout ratio.

(ii) Market price of share at optimum dividend payout ratio.

(iii) P/E ratio, at which the dividend policy will have no effect on the price of share.

(iv) Market price of share at this P/E ratio.

(v) Market price of share using Dividend growth model.

**Ans**

(i) The EPS of the firm is ₹ 10, r =12%. The P/E Ratio is given at 12.5 and the cost of capital (Ke) may be taken as the inverse of P/E ratio. Therefore, Ke is 8% (i.e., 1/12.5). The value of the share is ₹ 130 which may be equated with Walter Model as follows:

$$P=\frac{D+\frac{r}{k_e}(E-D)}{K_e} \text{ or } p=\frac{D+\frac{12\%}{8\%}(10\%-D)}{8\%}$$

or [D+1.5(10-D)]/0.08=130 or
D+15-1.5D=10.4
or -0.5D=-4.6
So, D = ₹ 9.2
The firm has a dividend pay-out of 92% (i.e., 9.2/10).

(ii) Since the rate of return of the firm (r) is 12% and it is more than the Ke of 8%, therefore, by distributing 92% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be:

$$P=\frac{D+\frac{12\%}{8\%}(10\%-0)}{8\%}$$

P = ₹ 187.5
So, theoretically the market price of the share can be increased by adopting a zero pay-out.

(iii) The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the Ke would be equal to the rate of return (r) of the firm. The Ke would be 12% (= r) at the P/E ratio of 1/12%=8.33. Therefore, at the P/E ratio of 8.33, the dividend policy would have no effect on the value of the share.

(iv) If the P/E is 8.33 instead of 12.5, then the Ke which is the inverse of P/E ratio, would be 12% and in such a situation ke= r and the market price, as per Walter's model would be:

$$P = \frac{D + \frac{r}{k_e}(E - D)}{k_e} = \frac{9.2 + \frac{12\%}{0.12}(10\% - 9.2)}{0.12} = ₹\ 83.33$$

Dividend Growth Model applying growth on dividend
Ke = 8%, r = 12%, D0 = 9.2, b = 0.08
g = b.r
g = 0.08 x 0.12=0.96%
D1 = D0 (1+g) = 9.2 (1+0.0096) = ₹ 9.2883

$$P = \frac{D_1}{(Ke - g)} = 9.2883/(0.08 - 0.0096) = 9.2883/0.0704 = ₹\ 131.936$$

**Alternative**
**Alternatively, without applying growth on dividend**

$$P = \frac{E(1-b)}{Ke - br} = \frac{10(1 - 0.08)}{0.08 - (0.08' 0.12)} = ₹\ 130.68$$

**Q.2** Dividend policy | MTP May 19(1)

(a) LIST the factors determining the dividend policy of a company.

**Ans**

(a) Factors Determining the Dividend Policy of a Company

(i) Liquidity: In order to pay dividends, a company will require access to cash. Even very profitable companies might sometimes have difficulty in paying dividends if resources are tied up in other forms of assets.

(ii) Repayment of debt: Dividend payout may be made difficult if debt is scheduled for repayment

(iii) Stability of Profits: Other things being equal, a company with stable profits is more likely to pay out a higher percentage of earnings than a company with fluctuating profits.

(iv) Control: The use of retained earnings to finance new projects preserves the company's ownership and control. This can be advantageous in firms where the present disposition of shareholding is of importance.

(v) Legal consideration: The legal provisions lay down boundaries within which a company can declare dividends.

(vi) Likely effect of the declaration and quantum of dividend on market prices. (vii) Tax considerations and

(viii) Others such as dividend policies adopted by units similarly placed in the industry, management attitude on dilution of existing control over the shares, fear of being branded as incompetent or inefficient, conservative policy Vs non-aggressive one.

(ix) Inflation: Inflation must be taken into account when a firm establishes its dividend policy.

**Q.3** Growth Model | MTP May 18

A company had paid dividend of ₹ 2 per share last year. The estimated growth of the dividends from the company is estimated to be 5% p.a. DETERMINE the estimated market price of the equity share if the estimated growth rate of dividends (i) rises to 8%, and (ii) falls to 3%. Also COMPUTE the present market price of the share, given that the required rate of return of the equity investors is 15.5%.

**Ans**

In this case the company has paid dividend of ₹2 per share during the last year. The growth rate (g) is 5%. Then, the current year dividend (D1) with the expected growth rate of 5% will be ₹ 2.10

The share price is = $P_o = \frac{D_1}{Ke - g}$

$$= \frac{2.10}{0.155 - 0.05}$$

= ₹ 20

(i) In case the growth rate rises to 8% then the dividend for the current year (D1) would be ₹ 2.16 and market price would be-

$$= \frac{2.16}{0.155 - 0.08}$$

= ₹ 28.80

(ii) In case growth rate falls to 3% then the dividend for the current year (D1) would be ₹2.06 and market price would be-

$$= \frac{2.16}{0.155 - 0.03}$$

= ₹16.48

So, the market price of the share is expected to vary in response to change in expected growth rate is dividends.

**Q.4** MM Approach | RTP May 23

Rambo Limited Has 1,00,000 equity shares outstanding for the year 2022. The current market price of the shares is ₹ 100 each. Company is planning to pay dividend of ₹ 10 per share. Required rate of return is 15%. Based on Modigliani-Miller approach, calculate the market price of the share of the company when the recommended dividend is 1) declared and 2) not declared.

How many new shares are to be issued by the company at the end of the year on the assumption that net income for the year is ₹ 40 Lac and the investment budget is ₹ 50,00,000 when dividend is declared, or dividend is not declared.

PROOF that the market value of the company at the end of the accounting year will remain same whether dividends are distributed or not distributed.

**Ans**

**CASE 1: Value of the firm when dividends are not paid.**

**Step 1:** Calculate price at the end of the period

Ke = 15%, $P_0$ = ₹100, $D_1$ = 0

$$P_0 = \frac{P_1 + D_1}{1 + Ke}$$

$$₹100 = \frac{P_1 + 0}{1 + 0.15}$$

$P_1$ = ₹115

**Step 2:** Calculation of funds required for investment

| | | |
|---|---|---|
| Earning | | ₹ 40,00,000 |
| Dividend distributed | | Nil |
| Fund available for investment | | ₹ 40,00,000 |
| Total Investment | | ₹ 50,00,000 |
| Balance Funds required | ₹ 50,00,000 - ₹ 40,00,000 = | ₹ 10,00,000 |

**Step 3:** Calculation of No. of shares required to be issued for balance funds

No. of shares = Funds required/P1

Δn = ₹10,00,000/₹115

**Step 4:** Calculation of value of firm $nP_o$ = [(n+Δn)P1-I+E]/(1+Ke)
$nP_0$ = [(100000+1000000/₹115) ₹115 - ₹5000000 + ₹4000000]/(1.15)
= ₹1,00,00,000

**CASE 2: Value of the firm when dividends are paid.**
**Step 1:** Calculate price at the end of the period
Ke= 15%, $P_0$= ₹100, $D_1$= ₹10

$$P_o = \frac{P1 + D1}{1 + Ke}$$

$$₹100 = \frac{P1 + 10}{1 + 0.15}$$

$P_1$ = ₹105

**Step 2:** Calculation of funds required for investment

| | | |
|---|---|---|
| Dividend distributed | | 10,00,000 |
| Fund available for investment | | ₹ 30,00,000 |
| Total Investment | | ₹ 50,00,000 |
| Balance Funds required | ₹ 50,00,000 - ₹ 30,00,000 = | ₹ 20,00,000 |

Step 3: Calculation of No. of shares required to be issued for balance fund

No. of shares = Funds Required/P1

Δn = ₹2000000/₹105

Step 4: Calculation of value of firm

$nP_o$ = [(n+Δn)P1 – I+E]/(1+Ke)

$nP_0$ = [(100000 + 2000000/₹105) ₹105 – ₹5000000 + ₹4000000]/(1.15)= ₹1,00,00,000

**Thus, it can be seen from the above calculations that the value of the firm remains the same in either case.**

**Q.5** MM Approach | RTP Nov 22

Ordinary shares of a listed company are currently trading at ₹ 10 per share with two lakh shares outstanding. The company anticipates that its earnings for next year will be ₹ 5,00,000. Existing cost of capital for equity shares is 15%. The company has certain investment proposals under discussion which will cause an additional 26,089 ordinary shares to be issued if no dividend is paid or an additional 47,619 ordinary shares to be issued if dividend is paid.

Applying the MM hypothesis on dividend decisions, CALCULATE the amount of investment and dividend that is under consideration by the company.

**Ans**

P0 = ₹ 10 n = 2,00,000, E = ₹ 5,00,000
Ke = 15%, Δn = 26,089, I = ?

$$P_0 = \frac{P_1}{1 + Ke}$$

$$10 = \frac{P_1}{1.5}$$

P1 = 11.5

$$\Delta n = \frac{I - E + nD1}{P1}$$

$$26{,}089 = \frac{I - 5{,}00{,}000}{11.5}$$

$I = 8{,}00{,}024$

Now,

P0 = ₹ 10, n = ₹ 2,00,000,

E = ₹ 5,00,000, I = 8,00,024, Ke = 15%, Δn 47,619, D1 = ?

$$P = \frac{P_1 + D_1}{1 + Ke}$$

$$10 = \frac{P_1 + D_1}{1.15}$$

P1 = 11.5

$$\Delta n = \frac{I - E + nD1}{P_1}$$

$$26{,}089 = \frac{I - 5{,}00{,}000}{11.5}$$

I = 8,00,024

Now,

P0 = ₹ 10, n = ₹ 2,00,000,

E = ₹ 5,00,000, I = 8,00,024, Ke = 15%, Δn 47,619, D1 = ?

$$P = \frac{P_1 + D_1}{1 + ke}$$

$$10 = \frac{P_1 + D_1}{1.5}$$

P1 + D1 = 11.5

P1 = 11.5 - D1 ..... 1

$$\Delta n = \frac{I - E + nD_1}{P_1}$$

$$47{,}619 = \frac{8{,}00{,}024 - 5{,}00{,}000 + 2{,}00{,}000D_1}{P_1}$$

47,619 P1 = 2,00,000 D1 + 3,00,024

From 1,

47619 (11.5 – $D_1$) = 2,00,000 $D_1$ + 3,00,024

5,47,618.5 – 47,619$D_1$ = 2,00,000$D_1$ + 3,00,024

2,47,594.5 $= 2,00,000D_1 + 47,619\ D_1$

2,47,594.5 $= 2,47,619\ D_1$

$D1 = \frac{2,47,594.5}{2,47,619} = 0.99 = ₹\ 1$

$P1 = 11.5 - D_1$

$P1 = 11.5 - 1$

$P1 = 10.5$

$$n.P_0 = \frac{(n + Dn)P_1 - I + E}{1 + Ke}$$

$$\frac{(2,00,000 + 47,619)(10.5) - 8,00,024 + 5,00,000}{1.15}$$

$n.P_0$ = ₹19,99,979 = ₹20,00,000

Using direct calculation,

$n.P_0$ = 2,00,000 ×10 = ₹ 20,00,000

**Q.6** MM Approach | RTP Dec 21

Aakash Ltd. has 10 lakh equity shares outstanding at the start of the accounting year 2021.

The existing market price per share is ₹ 150. Expected dividend is ₹ 8 per share. The rate of capitalization appropriate to the risk class to which the company belo ngs is 10%.

(i) CALCULATE the market price per share when expected dividends are: (a) declared, and (b) not declared, based on the Miller – Modigliani approach.

(ii) CALCULATE number of shares to be issued by the company at the end of the accounting year on the assumption that the net income for the year is ₹ 3 crore, investment budget is ₹ 6 crores, when (a) Dividends are declared, and (b) Dividends are not declared.

(iii) PROOF that the market value of the shares at the end of the accounting year will remain unchanged irrespective of whether (a) Dividends are declared, or (ii) Dividends are not declared.

**Ans**

**(i) Project N.**

Calculation of market price per share

According to Miller – Modigliani (MM) Approach:

$$Po = \frac{P_1 + D_1}{1 + Ke}$$

Where,

Existing market price (Po) = ₹ 150

Expected dividend per share (D1) = ₹ 8

Capitalization rate (ke) = 0.10

Market price at year end (P1) = to be determined

(a) If expected dividends are declared, then

$$₹\ 150 = \frac{P1 + 8}{1 + 0.10}$$

$$P1 = ₹\ 157$$

(b) If expected dividends are not declared, then

$$₹\ 150 = \frac{P_1 + 0}{1 + 0.10}$$

$$P1 = ₹\ 165$$

**(ii) Calculation of number of shares to be issued**

| | (a) Dividends ar declared lakh) | (b) Dividends are not Declared (₹ lakh) |
|---|---|---|
| Net income | 300 | 300 |
| Total dividends | (80) | - |
| Retained earnings | 220 | 300 |
| Investment budget | 600 | 600 |
| Amount to be raised by new issues | 380 | 300 |
| Relevant market price (₹ per share) | 157 | 165 |
| No. of new shares to be issued (in lakh) (₹ 380 ÷ 157; ₹ 300 ÷ 165) | 2.42 | 1.82 |

**(iii) Calculation of market value of the shares**

| | (a) Dividends are declared | (b) Dividends are not Declared |
|---|---|---|
| Existing shares (in lakhs) | 10.00 | 10.00 |
| New shares (in lakhs) | 2.42 | 1.82 |
| Total shares (in lakhs) | 12.42 | 11.82 |
| Market price per share (₹) | 157 | 165 |
| Total market value of shares at the end of the year (₹ in lakh) | 12.42 × 157 = 1,950 (approx.) | 11.82 × 165 = 1,950 (approx.) |

Hence, it is proved that the total market value of shares remains unchanged irrespective of whether dividends are declared, or not declared.

**Q.7** MM Approach | MTP Nov 23(1)

ZX Ltd. has a paid-up share capital of ₹ 2,00,00,000, face value of ₹ 100 each. The current market price of the shares is ₹ 100 each. The Board of Directors of the company has an agenda of meeting to pay a dividend of 50% to its shareholders. The company expects a net income of ₹ 1,50,00,000 at the end of the current financial year. Company also plans for a capital expenditure for the next financial year for a cost of ₹ 1,90,00,000, which can be financed through retained earnings and issue of new equity shares.

Company's desired rate of investment is 15%.

Required:

Following the Modigliani- Miller (MM) Hypothesis, DETERMINE value of the company when:

(i) It does not pay dividend and (ii) It does pay dividend

**Ans**

$$V_1 \text{ or } nP_0 = \frac{(n + \Delta n)P_1 - I + E}{(1 + Ke)}$$

Where,

Vf = Value of firm in the beginning of the period
n = number of shares in the beginning of the period
Δn = number of shares issued to raise the funds required
I = Amount required for investment
E = total earnings during the period

**(i) Value of the ZX Ltd. when dividends are not paid.**

$$nP_o = \frac{(n + \Delta n)P_1 - I + E}{(1 + Ke)}$$

$$nP_o = \frac{2,00,000\left(\frac{40,00,000}{115}\right) \times 115 - Rs.1,90,00,000 + 1,50,00,000}{(1 + 0.15)}$$

$$= \frac{2,70,00,000 - 1,90,00,000 + 1,50,00,000}{1 + 0.5} = ₹\ 2,00,00,000$$

Working notes:

1. Price of share at the end of the period (P1)

$$P_o = \frac{P_1 + D_1}{1 + Ke}$$

$$100 = \frac{P_1 + 0}{1 + 0.15} \text{ or, } P_1 = 115$$

2. Calculation of funds required for investment

| | |
|---|---|
| Earnings | ₹1,50,00,000 |
| Dividend distributed | Nil |
| Fund available for investment | ₹ 1,50,00,000 |
| Total Investment | ₹ 1,90,00,000 |
| Balance Funds required | ₹ 40,00,000 |

3. Calculation of no. of shares required to be issued for balance fund

$$\text{No. of shares } (\Delta n) = \frac{\text{Funds required}}{\text{Price at end } (P_1)} = \frac{40,00,000}{115} \text{ shares}$$

**(ii) Value of the ZX Ltd. when dividends are paid.**

$$nP_o = \frac{(n + \Delta n)P - I + E}{1 + K_e}$$

$$nP_o = \frac{2,00,000\left(\frac{140,00,000}{65}\right) \times 65 - 1,90,00,000 + 1,50,00,000}{(1 + 0.15)}$$

$$= \frac{2,70,00,000 - 1,90,00,000 + 1,50,00,000}{(1 + 0.15)} = ₹\ 2,00,00,000$$

Working notes:

4. Price of share at the end of the period (P1)

$$P_o = \frac{P_1 + D_1}{1 + Ke}$$

$$100 = \frac{P_2 + 50}{1 + 0.15} \text{ or, } \quad P_1 = ₹65$$

5. Calculation of funds required for investment

| | |
|---|---|
| Earnings | ₹ 1,50,00,000 |
| Dividend distributed | ₹ 1,00,00,000 |
| Fund available for investment | ₹ 50,00,000 |
| Total Investment | ₹ 1,90,00,000 |
| Balance Funds required | ₹ 1,40,00,000 |

6. Calculation of no. of shares required to be issued for balance fund

$$\text{No. of shares } (\Delta n) = \frac{\text{Funds required}}{\text{Priceat end } (P_1)} = \frac{1,40,00,000}{65} = 2,15,385 \text{ shares(approx.)}$$

Note- As per MM-hypothesis of dividend irrelevance, value of firm remains same irrespective of dividend paid. In the solution, there may be variation in value, which is due to rounding off error.

**Q.8** MM Approach | MTP May 23 (1)

Roma Nov Ltd. has a capital of ₹25,00,000 in equity shares of ₹100 each. The shares are currently quoted at ₹120. The company proposes to declare a dividend of ₹15 per share at the end of the current financial year. The capitalization rate for the risk class of which the company belongs is 15%. COMPUTE market price of the share at the end of the year, if

(i) Dividend is not declared.

(ii) Dividend is declared.

Assuming that the company pays the dividend and has net profits of ₹9,00,000 and makes new investments of ₹15,00,000 during the period, CALCULATE number of new shares to be issued? Use the MM model.

**Ans**

| Cost of Equity (Ke) | 15% |
|---|---|
| Number of shares in the beginning (n) | 25,000 |
| Current Market Price (P0) | 120 |

| | |
|---|---|
| Net Profit (E) | 9,00,000 |
| Expected Dividend (D1) | 15 |
| Investment (I) | 15,00,000 |

**Computation of market price per share, when:**

(i) No dividend is declared:

$$Po = P_1 + D_1 \frac{P_1 + D_1}{1 + ke}$$

$$₹120 = \frac{P1 + 0}{1 + 0.15}$$

$P_1$ = ₹138 – 0 = ₹ 138 (ii) Dividend is declared:

$$₹120 = \frac{P_1 + 15}{1 + 0.15}$$

P1 = ₹138 – ₹15 = ₹ 123

**Calculation of number of shares required for investment.**

| | ₹ |
|---|---|
| Earnings | 9,00,000 |
| Dividend distributed | 3,75,000 |
| Fund available for investment | 12,75,000 |
| Total Investment | 15,00,000 |
| Balance Funds required | 15,00,000 – 12,75,000 = 2,25,000 |

$$\text{No. of shares} = \frac{\text{Funds required}}{\text{Price at end}(P_1)}$$

$$= \frac{2,25,000}{123} = 1,830 \text{ Shares(approx.)}$$

**Q.9** MM Approach | MTP Dec 21(1)

M Ltd. belongs to a risk class for which the capitalization rate is 12%. It has 40,000 outstanding shares and the current market price is ₹ 200. It expects a net profit of ₹ 5,00,000 for the year and the Board is considering dividend of ₹ 10 per share.

M Ltd. requires to raise ₹ 10,00,000 for an approved investment expenditure. ILLUSTRATE, how the MM approach affects the value of M Ltd. if dividends are paid or not paid.

**Ans**

| | |
|---|---|
| Cost of Equity (Ke) | 12% |
| Number of shares in the beginning (n) | 40,000 |
| Current Market Price (P0) | ₹200 |
| Net Profit (E) | ₹5,00,000 |
| Expected Dividend (D1) | ₹10 per share |
| Investment (I) | ₹10,00,000 |

**Situation 1 – When dividends are paid**

(i) $P0 = \frac{P1 + D1}{1 + ke}$

**Situation 2 – When dividends are not paid**

(i) $P0 = \frac{P1 + D1}{1 + ke}$

$$200 = \frac{P1 + 0}{1 + 0.12}$$

$$P1 + 10 = 200 \times 1.12$$

$$P1 = 224 - 10 = 214$$

(ii) Calculation of funds required
= Total Investment - (Net profit - Dividend)
= 10,00,000 - (5,00,000 – 4,00,000)
= 9,00,000

(iii) No. of shares required to be issued for balance fund balance fund

$$\text{No. of shares} = \frac{\text{Funds Required}}{\text{Price at end}(P_1)}$$

$$\Delta n = \frac{9,00,000}{214} = 4205.61$$

(iv) Calculation of value of firm

$$V_1 = \frac{(n+n)P1 - I + E}{1+Ke}$$

$$= \frac{\left(40,000 + \frac{9,00,000}{214}\right)214 - 10,00,000 + 5,00,000}{1 + 0.12}$$

$$= \frac{94,60,000 - 5,00,000}{1.12} = 80,00,000$$

$$200 = \frac{P1 + 0}{1 + 0.12}$$

$$P_1 + 0 = 200 \times 1.12$$

$$P1 = 224 - 10 = 214$$

(ii) Calculation of funds required
= Total Investment - (Net profit - Dividend)
= 10,00,000 – (5,00,000 - 0)
= 5,00,000

(iii) No. of shares required to be issued for

$$\text{No. of shares} = \frac{\text{Funds Required}}{\text{Price at end}(P_1)}$$

$$\Delta n = \frac{5,00,000}{214} = 2232.14$$

(iv) Calculation of value of firm

$$V_1 = \frac{(n+n)P1 - I + E}{1+Ke}$$

$$= \frac{\left(40,000 + \frac{5,00,000}{224}\right)224 - 10,00,000 + 5,00,000}{1 + 0.12}$$

$$= \frac{94,60,000 - 5,00,000}{1.12} = 80,00,000$$

**Q.10** MM Approach | MTP May 20

ZX Ltd. has a paid-up share capital of Rs.1,00,00,000, face value of Rs.100 each. The current market price of the shares is Rs.100 each. The Board of Directors of the company has an agenda of meeting to pay a dividend of 50% to its shareholders. The company expects a net income of Rs.75,00,000 at the end of the current financial year. Company also plans for a capital expenditure for the next financial year for a cost of Rs.95,00,000, which can be financed through retained earnings and issue of new equity shares.
Company's desired rate of investment is 15%.
Required:
Following the Modigliani- Miller (MM) Hypothesis, DETERMINE value of the company when:
(i) It does not pay dividend and
(ii) It does pay dividend

**Ans**

$$V \text{ or } nP_0 = \frac{(n + \Delta n)P_1 - I + E}{(1 + Ke)}$$

Where,

| | | |
|---|---|---|
| Vf | = | Value of firm in the beginning of the period |
| n | = | number of shares in the beginning of the period |
| Δn | = | number of shares issued to raise the funds required |
| I | = | Amount required for investment |

E = total earnings during the period

**(i) Value of the ZX Ltd. when dividends are not paid.**

$$nP_o = \frac{(n + \Delta n)P_1 - I + E}{(1 + Ke)}$$

$$nP_o = \frac{\left(1,00,000 + \frac{20,00,000}{115}\right)x115 - 95,00,000 + 75,00,000}{1 + 0.15}$$

$$= \frac{Rs.1,35,00,000 - Rs.95,00,000 + Rs.75,00,000}{(1 + 0.15)} = Rs.1,00,00,000$$

**Working notes:**

**1. Price of share at the end of the period (P1)**

$$P_o = \frac{P_1 + D_1}{1 + Ke}$$

$$100 = \frac{P_1 + 0}{1 + 0.15}$$

or, $P_1 = 115$

**2. Calculation of funds required for investment**

| | |
|---|---|
| Earnings | Rs.75,00,000 |
| Dividend distributed | Nil |
| Fund available for investment | Rs.75,00,000 |
| Total Investment | Rs.95,00,000 |
| Balance Funds required | Rs.20,00,000 |

**3. Calculation of no. of shares required to be issued for balance fund**

$$\text{No. of shares } (\Delta n) = \frac{\text{Funds Required}}{\text{Price at end}(P_1)} = \frac{20,00,000}{115} \text{ shares}$$

**(ii) Value of the ZX Ltd. when dividends are paid.**

$$nP_o = \frac{(n + \Delta n)P_1 - I + E}{(1 + Ke)}$$

$$nP_o = \frac{\left(1,00,000 + \frac{70,00,000}{65}\right)x65 - 95,00,000 + 75,00,000}{1 + 0.15}$$

$$= \frac{Rs.1,35,00,000 - Rs.95,00,000 + Rs.75,00,000}{(1 + 0.15)} = Rs.1,00,00,000$$

**Working notes:**

**4. Price of share at the end of the period (P1)**

$$P_o = \frac{P_1 + D_1}{1 + Ke}$$

$$100 = \frac{P_1 + 50}{1 + 0.15} \quad \text{or,} \quad P_1 = Rs.65$$

**5. Calculation of funds required for investment**

| | |
|---|---|
| Earnings | Rs.75,00,000 |
| Dividend distributed | Rs.50,00,000 |
| Fund available for investment | Rs.25,00,000 |
| Total Investment | Rs.95,00,000 |
| Balance Funds required | Rs.70,00,000 |

**6. Calculation of no. of shares required to be issued for balance fund**

$$\text{No. of shares } (\Delta n) = \frac{\text{Funds Re quired}}{\text{Price at end}(P_1)} = \frac{70,00,000}{65} = 1,07,693 \text{ shares(approx.)}$$

Note- As per MM-hypothesis of dividend irrelevance, value of firm remains same irrespective of dividend paid. In the solution, there may be variation in value, which is due to rounding off error.

**Q.11** MM Approach | MTP Nov 18(2)

M Ltd. belongs to a risk class for which the capitalization rate is 10%. It has 25,000 outstanding shares and the current market price is Rs. 100. It expects a net profit of Rs. 2,50,000 for the year and the Board is considering dividend of Rs. 5 per share.

M Ltd. requires to raise Rs. 5,00,000 for an approved investment expenditure. ANALYSE, how the MM approach affects the value of M Ltd. if dividends are paid or not paid.

**Ans**

**A When dividend is paid**

(a) Price per share at the end of year 1

$$100 = \frac{1}{1.10} \quad (Rs.\ 5 + P_1)$$

$$110 = Rs.\ 5 + P1$$

$$P1 = 105$$

(b) Amount required to be raised from issue of new shares

Rs.5,00,000 – (Rs.2,50,000 – Rs.1,25,000)

Rs.5,00,000 – Rs.1,25,000 = Rs.3,75,000

(c) Number of additional shares to be issued

$$\frac{3,75,000}{105} = \frac{75,000}{21} \text{ shares or say 3,572 shares}$$

(d) Value of M Ltd.

(Number of shares × Expected Price per share)

i.e., (25,000 + 3,572) × Rs.105 = Rs.30,00,060

**B When dividend is not paid**

(a) Price per share at the end of year 1

$$100 = \frac{P_1}{1.10}$$

$$P1 = 110$$

(b) Amount required to be raised from issue of new shares

Rs.5,00,000 – 2,50,000 = 2,50,000

(c) Number of additional shares to be issued

$$\frac{2,50,000}{110} = \frac{2,50,000}{11} \text{ shares or say 2,273 shares.}$$

(d) Value of M Ltd.,

(25,000 + 2273) × Rs.110
= Rs.30,00,030
Whether dividend is paid or not, the value remains the same.

**Q.12** MM Approach | MTP Nov 18(1)

RST Ltd. has a capital of Rs. 10,00,000 in equity shares of Rs. 100 each. The shares are currently quoted at par. The company proposes to declare a dividend of Rs. 10 per share at the end of the current financial year. The capitalization rate for the risk class of which the company belongs is 12%. COMPUTE the market price of the share at the end of the year, if

(i) a dividend is not declared?
(ii) a dividend is declared?
(iii) assuming that the company pays the dividend and has net profits of Rs.5,00,000 and makes new investments of Rs.10,00,000 during the period, how many new shares must be issued? Use the MM model.

**Ans**

As per MM model, the current market price of equity share is:

$$P_0 = \frac{1}{1+ ke} \times (D_1 + P_1)$$

**(i) If the dividend is not declared:**

$$100 = \frac{1}{1+0.12} \times (0 + P_1)$$

$$100 = \frac{P_1}{1.12}$$

P1 = Rs.112

The Market price of the equity share at the end of the year would be Rs.112.

**(ii) If the dividend is declared:**

$$100 = \frac{1}{1+0.12} \times (10 + P_1)$$

$$100 = \frac{P_1}{1.12} =$$

112 = 10 + P1
P1 = 112 – 10 = Rs.102
The market price of the equity share at the end of the year would be Rs.102.

**(iii) In case the firm pays dividend of Rs.10 per share out of total profits of Rs. 5,00,000 and plans to make new investment of Rs. 10,00,000, the number of shares to be issued may be found as follows:**

| | |
|---|---|
| Total Earnings | Rs.5,00,000 |
| - Dividends paid | (1,00,000) |
| Retained earnings | 4,00,000 |
| Total funds required | 10,00,000 |

| | |
|---|---|
| Fresh funds to be raised | 6,00,000 |
| Market price of the share | 102 |

Number of shares to be issued (Rs.6,00,000 / 102) 5,882.35 or, the firm would issue 5,883 shares at the rate of Rs.102

**Q.13** MMP Approach & Gordan | MTP May 23(2)

Rex Ltd has 20 lakh equity shares outstanding at the start of the accounting year 202 3. The existing market price per share is ₹ 300. Expected dividend is ₹ 20 per share. The rate of capitalization appropriate to the risk class to which the company belongs is 20%.

CALCULATE the market price per share when expected dividends are: (a) declared, and (b) not declared, based on the Miller – Modigliani approach.

CALCULATE number of shares to be issued by the company at the end of the accounting year on the assumption that the net income for the year is ₹ 5 crore; investment budget is ₹ 8 crores, when (a) Dividends are declared, and (b) Dividends are not declared.

PROVE that the market value of the shares at the end of the accounting year will remain unchanged irrespective of whether (a) Dividends are declared, or (ii) Dividends are not declared.

WHAT is the implied growth rate in dividends as per Gordon's model, if expected dividend payment is considered imminent?

**Ans**

**(i) Calculation of market price per share**

According to Miller – Modigliani (MM) Approach:

$$Po = \frac{P_1 + D1}{1+ke}$$

Where,

Existing market price (Po) = ₹ 300

Expected dividend per share ($D_1$) = ₹ 20

Capitalization rate (ke) = 0.20 Market price at year end (P1) = ?

a. If expected dividends are declared, then

300=(P1+20)/(1+0.2)

300 x 1.2 = P1+20

P1= 340

b. If expected dividends are not declared, then

300=(P1+0)/(1+0.2)

300 x 1.2 = P1

P1= 360

**(ii) Calculation of number of shares to be issued**

| | (a) Dividends are declared.(₹ lakh) | (b) Dividends are not Declared (₹ lakh) |
|---|---|---|
| Net income | 500 | 500 |

| | | |
|---|---|---|
| Total dividends | (400) | - |
| Retained earnings | 100 | 500 |
| Investment budget | 800 | 800 |
| Amount to be raised by new issues | 700 | 300 |
| Relevant market price (₹ per share) | 340 | 360 |
| No. of new shares to be issued (in lakh) (₹ 700 ÷ 340; ₹ 300 ÷ 360) | 2.0588 | 0.8333 |

**(iii) Calculation of market value of the shares**

| Particulars | (a) Dividends are declared | (b) Dividends are not Declared |
|---|---|---|
| Existing shares (in lakhs) | 20.00 | 20.00 |
| New shares (in lakhs) | 2.0588 | 0.8333 |
| Total shares (in lakhs) | 22.0588 | 20.8333 |
| Market price per share (₹) | 340 | 360 |
| Total market value of shares at the end of the year (₹ in lakh) | 22.0588 × 340 = 7,500 (approx.) | 20.8333 × 360 = 7,500 (approx.) |

Hence, it is proved that the total market value of shares remains unchanged irrespective of whether dividends are declared, or not declared.

**(iv) P0=D1/(Ke-g)**

300 = 20/(0.2-g)

0.2-g = 20/300

0.2-g = 0.0667

G = 0.133333

g = 13.3333%

**Q.14** Gordan's Model | RTP Nov 23

HM Ltd. is listed on Bombay Stock Exchange which is currently been evaluated by Mr. A on certain parameters.Mr. A collated following information:

(a) The company generally gives a quarterly interim dividend. ₹ 2.5 per share is the last dividend declared.

(b) The company's sales are growing by 20% on a 5-year Compounded Annual Growth Rate (CAGR) basis, however the company expects following retention amounts against probabilities mentioned as contention is dependent upon cash requirements for the company. Rate of return is 10% generated by the company.

| Situation | Prob. | Retention Ratio |
|---|---|---|
| A | 30% | 50% |
| B | 40% | 60% |
| C | 30% | 50% |

(c) The current risk-free rate is 3.75% and with a beta of 1.2 company is having a risk premium of 4.25%. You are required to help Mr. A in calculating the current market price using Gordon's formula.

**Ans** Market price using Gordon's formula

D0 (1 + g)

$$P_0 = \frac{D_0\ (1+g)}{ke\ -g}$$

D0 = 2.5×4 = 10 per share (annual)

g = br or retention ratio x rate of return

Calculation of expected retention ratio

| Situation | Prob. | Retention Ratio | Expected Retention Ratio |
|---|---|---|---|
| A | 30% | 50% | 0.15 |
| B | 40% | 60% | 0.24 |
| C | 30% | 50% | 0.15 |
| Total | | | 0.54 |

g = 0.54 × 0.10= 0.054 or 5.4% $P_0$

$$P_0 = \frac{D_0\ (1+g)}{ke\ -g}$$

Ke - g

$$P_0 = \frac{10(1+0.054)}{0.0885\ -0.054} = \frac{10.54}{0.0345} = 305.51$$

Ke = Risk free rate + (Beta x Risk Premium)

= 3.75% + (1.2 x 4.25%) = 8.85%

**Q.15** MPS Using Gordon's Model | PY Dec 21

X Ltd. is a multinational company. Current market price per share is ₹ 2,185. During the F.Y. 2020-21, the company paid ₹ 140 as dividend per share. The company is expected to grow @ 12% p.a. for next four years, then 5% p.a. for an indefinite period. Expected rate of return of shareholders is 18% p.a.

(i) Find out intrinsic value per share.

(ii) State whether shares are overpriced or under priced.

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Discounting Factor @ 18% | 0.847 | 0.718 | 0.608 | 0.515 | 0.436 |

**Ans**

**As per Dividend discount model, the price of share is calculated as follows:**

$$P=\frac{D_1}{(1+Ke)^1}+\frac{D_2}{(1+Ke)^2}+\frac{D_3}{(1+Ke)^3}+\frac{D_4}{(1+Ke)^4}+\frac{D_4(1+g)}{(Ke-g)}x\frac{1}{(1+Ke)^4}$$

Where,

P = Price per share

$K_e$ = Required rate of return on equity

g = Growth rate

$$P = \frac{140x1.12}{(1\ +\ 0.18)^1}+\frac{156.80\ x\ 1.12}{(1\ +\ 0.18)^2}+\frac{175.62\ x1.12}{(1\ +\ 0.18)^3}+\frac{196x1.12}{(1\ +0.18)^4}+\frac{220.29(1+0.05)}{(0.18-0.05)}x\frac{1}{(1+0.18)^4}$$

P= 132.81 + 126.10 + 119.59 + 113.45 + 916.34 = ₹ 1,408.29

Intrinsic value of share is ₹ 1,408.29 as compared to latest market price of ₹2,185. Market price of share is over-priced by ₹ 776.71.

**Q.16** MPS using Gordon's Model | RTP May 19

The following figures are collected from the annual report of XYZ Ltd.:

| | |
|---|---|
| Net Profit | ₹30 lakhs |
| Outstanding 12% preference shares | ₹100 lakhs |
| No. of equity shares | 3 lakhs |
| Return on Investment | 20% |
| Cost of capital i.e. ($K_e$) | 16% |

CALCULATE price per share using Gordon's Model when dividend pay-out is (i) 25%; (ii) 50% and (iii) 100%.

**Ans**

| | ₹ in lakhs |
|---|---|
| Net Profit | 30 |
| Less: Preference dividend | 12 |
| Earning for equity shareholders | 18 |
| Therefore earning per share | 18/3 = ₹ 6.00 |

Price per share according to Gordon's Model is calculated as follows:

$$P_0 = \frac{E_1(1- b)}{Ke-br}$$

Here, E1 = 6, $K_e$ = 16%

(i) When dividend pay-out is 25%

$$P_0 = \frac{6x0.25}{0.16 - (0.75x0.2)} = \frac{1.5}{0.16 - 0.15} = 150$$

(ii) When dividend pay-out is 50%

$$P_0 = \frac{6x0.25}{0.16 - (0.5x0.2)} = \frac{3}{0.16 - 0.10} = 50$$

(iv) When dividend pay-out is 100%

$$P_0 = \frac{6x1}{0.16 - (0x0.2)} = \frac{6}{0.16} = 37.50$$

**Q.17** MPS using Gordon's Model | MTP Nov 22(2)

The annual report of XYZ Ltd. provides the following information for the Financial Year 2019-20:

| Particulars | Amount (₹) |
|---|---|
| Net Profit | 78 lakhs |
| Outstanding 15% preference shares | 120 lakhs |
| No. of equity shares | 6 lakhs |
| Return on Investment | 20% |
| Cost of capital i.e. ($K_e$) | 16% |

CALCULATE price per share using Gordon's Model when dividend pay-out is-

(i) 30%; (ii) 50%; (iii) 100%.

**Ans** **Price per share according to Gordon's Model is calculated as follows:**

| Particulars | Amount in ₹ |
|---|---|
| Net Profit | 78 lakhs |

| | |
|---|---|
| Less:Preference dividend(120 lakhs@15%) | 18 lakhs |
| Earnings for equity shareholders | 60 lakhs |
| Earnings Per Share | 60 lakhs/6 lakhs = ₹ 10.00 |

Price per share according to Gordon's Model is calculated as follows:

$$P_0 = \frac{E_1(1- b)}{Ke-br}$$

Here, E1 = 10, $K_e$ = 16%

(i) When dividend pay-out is 30%

$$P_0 = \frac{10\times0.30}{0.16 - (0.70\times 0.2)} = \frac{3}{0.16 - 0.14} = ₹150$$

(ii) When dividend pay-out is 50%

$$P_0 = \frac{10\times0.5}{0.16 - (0.5\times 0.2)} = \frac{5}{0.16 - 0.10} = ₹83.33$$

(iii) When dividend pay-out is 100%

$$P_0 = \frac{10\times1}{0.16 - (0\times 0.2)} = \frac{10}{0.16} = ₹ 62.5$$

**Q.18** MPS using Gordon's Model | MTP Nov 19

The following figures are collected from the annual report of XYZ Ltd.:

| | |
|---|---|
| Net Profit | Rs.60 lakhs |
| Outstanding 10% preference shares | Rs.100 lakhs |
| No. of equity shares | 5 lakhs |
| Return on Investment | 20% |
| Cost of capital i.e. (Ke) | 14% |

CALCULATE price per share using Gordon's Model when dividend pay-out is (i) 25%; (ii) 50% and (iii) 100%.

**Ans**

| | Rs. in lakhs |
|---|---|
| Net Profit | 60 |
| Less: Preference dividend | 10 |
| Earning for equity shareholders | 50 |
| Therefore earning per share | 50/5 = Rs.10.00 |

$$P_0 = \frac{E_1(1- b)}{Ke-br}$$

Here, E1 = 10, $K_e$ = 14%, r = 20%

(i) When dividend pay-out is 25%

$$P_0 = \frac{10x0.25}{0.14 - (0.75x0.2)} = \frac{25}{0.14 - 0.15} = 250$$

As per the Gordon's Dividend relevance model, the Cost of equity ($K_e$) should be greater than the growth rate i.e. br. In this case $K_e$ is 14% and br = 15%, hence, the equity investors would prefer capital appreciation than dividend.

(ii) When dividend pay-out is 50

When dividend pay-out is 50%

$$P_0 = \frac{10x0.5}{0.14 - (0.5x0.2)} = \frac{25}{0.14 - 0.10} = 125$$

(iii) When dividend pay-out is 100%

$$Po = \frac{10x1}{0.14 - (0x0.2)} = \frac{10}{0.14} = 71.43$$

**Q.19** Walter Model | RTP Nov 18

The earnings per share of a company is ₹ 10 and the rate of capitalisation applicable to it is 10 per cent. The company has three options of paying dividend i.e. (i) 50%, (ii) 75% and (iii) 100%.
CALCULATE the market price of the share as per Walter's model if it can earn a return of
(a) 15, (b) 10 and (c) 5 per cent on its retained earnings.

**Ans** Market Price (P) per share as per Walter's Model is:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

Where,

P = Price of Share
r = Return on investment or rate of earning
$K_e$ = Rate of Capitalisation or Cost of Equity
Calculation of Market Price (P) under the following dividend payout ratio and earning rates:

| | | (i) | (ii) | (iii) |
|---|---|---|---|---|
| | Rate of Earning (r) | DP ratio 50% | DP ratio 75% | DP ratio 100% |
| (a) | 15% | $\frac{5 + \left(\frac{0.15}{0.10}\right)(10-5)}{0.10} = \frac{12.5}{0.10} = ₹125$ | $\frac{7.5 + \left(\frac{0.15}{0.10}\right)(10-7.5)}{0.10} = \frac{11.25}{0.10} = ₹112.5$ | $\frac{10 + \left(\frac{0.15}{0.10}\right)(10-10)}{0.10} = \frac{10}{0.10} = ₹100$ |
| (b) | 10% | $\frac{5 + \left(\frac{0.10}{0.10}\right)(10-5)}{0.10} = \frac{10}{0.10} = ₹100$ | $\frac{7.5 + \left(\frac{0.10}{0.10}\right)(10-7.5)}{0.10} = \frac{10}{0.10} = ₹100$ | $\frac{10 + \left(\frac{0.10}{0.10}\right)(10-10)}{0.10} = \frac{10}{0.10} = ₹100$ |
| (c) | 5% | $\frac{5 + \left(\frac{0.05}{0.10}\right)(10-5)}{0.10} = \frac{7.5}{0.10} = ₹75$ | $\frac{7.5 + \left(\frac{0.05}{0.10}\right)(10-7.5)}{0.10} = \frac{8.75}{0.10} = ₹87.5$ | $\frac{10 + \left(\frac{0.05}{0.10}\right)(10-10)}{0.10} = \frac{10}{0.10} = ₹100$ |

**Q.20** Walter & Gordon Model | PY May 19

The following information is supplied to you :

| | |
|---|---|
| Total Earning | ₹ 40 Lakhs |
| No. of Equity Shares (of ₹ 100 each) | 4,00,000 |

| | |
|---|---|
| Dividend Per Share | ₹ 4 |
| Cost of Capital | 16% |
| Internal rate of return on investment | 20% |
| Retention ratio | 60% |

Calculate the market price of a share of a company by using :

(i) WaIter's Formula

(ii) Gordon's Formula

**Ans**

Earning Per share(E) $= \frac{40\ Lakhs}{4,00,000} = ₹\ 10$

Calculation of Market price per share by

(i) Walter's formula: Market Price (P) $= \frac{D + \frac{r}{K_e}(E-D)}{K_e}$

Where,

P = Market Price of the share.

E = Earnings per share.

D = Dividend per share.

Ke = Cost of equity/ rate of capitalization/ discount

R = Internal rate of return/ return on investment

$P = \frac{4 + \frac{0.20}{0.16}(10-4)}{0.16} = \frac{4 + 7.5}{0.16} = ₹\ 71.88$

(ii) Gordon's formula: When the growth is incorporated in earnings and dividend, the present value of market price per share (Po) is determined as follows

Gordon's theory: Po $\frac{E(1-b)}{k-br}$

Where,

$P_0$ = Present market price per share. E = Earnings per share

b = Retention ratio (i.e. % of earnings retained)

r = Internal rate of return

(IRR) Growth rate (g) = br

Now Po $= \frac{10\ (1-\ .60)}{16-(.60 \times .20)} = \frac{4}{.04} = ₹\ 100$

**Q.21** Walter & Gordon Model | RTP Nov 20

The following information is given for QB Ltd.

| | |
|---|---|
| Earnings per share | ₹ 120 |
| Dividend per share | ₹ 36 |
| Cost of capital | 15% |

Internal Rate of Return on investment 20%

CALCULATE the market price per share using

(a) Gordon's formula (b) Walter's formula

**Ans** (a) As per Gordon's Model, Price per share is computed using the formula:

$$Po = \frac{E_1(1-b)}{Ke-br}$$

Where,
Po = Price per share
$E_1$ = Earnings per share
b = Retention ratio; (1 - b = Pay-out ratio)
$K_e$ = Cost of capital
r = IRR
br = Growth rate (g)
Applying the above formula, price per share

$$Po = \frac{120(1-0.7)}{0.15-0.70x0.2} = \frac{36}{0.01} = ₹\ 3,600$$

(b) As per Walter's Model, Price per share is computed using the formula:
Price (**P**)
Where,
P = Market Price of the share.
E = Earnings per share. D = Dividend per share.
Ke = Cost of equity/ rate of capitalization/ discount rate.
r = Internal rate of return/ return on investment
Applying the above formula, price per share

$$P = \frac{36+\frac{0.20}{0.15}(120-36)}{0.15}$$

$$Or,\ P = \frac{36+112}{0.15} = ₹\ 986.67$$

**Q.22** Walter & Gordon model | MTP Nov 22(1)

Following information is given for WN Ltd.:

| | |
|---|---|
| Earnings | ₹ 30 per share |
| Dividend | ₹ 9 per share |
| Cost of capital | 15% |
| Internal Rate of Return on investment | 20% |

You are required to CALCULATE the market price per share using-
(i) Gordon's formula (ii) Walter's formula

**Ans** (i) As per Gordon's Model, Price per share is computed using the formula:

$$Po = \frac{E_1(1-b)}{Ke-br}$$

Where,
Po = Price per share
$E_1$ = Earnings per share
b = Retention ratio; (1 - b = Pay-out ratio) Ke = Cost of capital
r = IRR
br = Growth rate (g)
Applying the above formula, price per share

$$Po = \frac{30\times0.3}{0.15-0.70\times0.2} = \frac{9}{0.01} = ₹\ 900$$

*Dividend pay-out ratio = $\frac{9}{30}$ = 0.3 or 30%

(ii) As per Walter's Model, Price per share is computed using the formula:

$$\text{Price (P)} = \frac{D+\frac{r}{K_e}(E - D)}{K_e}$$

P = Market Price of the share
E = Earnings per share
D = Dividend per share
Ke = Cost of equity/ rate of capitalization/ discount rate
r = Internal rate of return/ return on investment
Applying the above formula, price per share

$$P = \frac{9+\frac{0.20}{0.15}(30 - 9)}{0.15} = \frac{37}{0.15} = ₹ 246.67$$

**Q.23** Walter & Gordon model | MTP May 21(1)

The following information is given:

| | |
|---|---|
| Dividend per share (DPS) | Rs. 9 |
| Cost of capital (Ke) | 19% |
| Internal rate of return on investment | 24% |
| Retention Ratio | 25% |

CALCULATE the market price per share by using:
(i) Walter's formula
(ii) Gordon's formula (Dividend Growth model)

**Ans** **Working:**

**Calculation of Earnings per share (EPS):**

$$\text{EPS} = \frac{\text{DPS}}{\text{Dividend Payout Ratio}}$$

$$\text{EPS} = \frac{9}{1-0.25} = \text{Rs.12}$$

Market price per share by
(i) Walter's model:

$$P = \frac{D+\frac{r}{K_e}(E - D)}{K_e}$$

$$= \frac{9+\frac{0.24}{0.19}(12 - 9)}{0.19}$$

= Rs. 67.31

(ii) Gordon's model (Dividend Growth model):

$$Po = \frac{D_1(1- g)}{Ke-g}$$

Where,
Po = Present market price per share.

g = Growth rate (br) = 0.25 × 0.24 = 0.06
b = Retention ratio
k = Cost of Capital
r = Internal rate of return (IRR)
$D_0$ = Dividend per share
E = Earnings per share

$$= \frac{9(1+0.06)}{0.19-0.06}$$

$$= \frac{9.54}{0.13} = \text{Rs.73.38}$$

Alternatively,

$$Po = \frac{E_1(1-b)}{Ke-br}$$

$$Po = \frac{12(1-0.25)}{0.19-0.06} = \frac{9}{0.13} = \text{Rs. 69.23}$$

**Q.24** Walter & Gordon Model | MTP May 19(1)

With the help of following figures CALCULATE the market price of a share of a company by using:

(i) Walter's formula
(ii) Dividend growth model (Gordon's formula)

| | |
|---|---|
| Earnings per share (EPS) | Rs. 10 |
| Dividend per share (DPS) | Rs. 6 |
| Cost of capital (k) | 20% |
| Internal rate of return on investment | 25% |
| Retention Ratio | 60% |

**Ans**

**Market price per share by**

(i) Walter's formula:

$$P = \frac{D+\frac{r}{K_e}(E-D)}{K_e}$$

$$P = \frac{6+\frac{0.25}{0.20}(10-6)}{0.20}$$

P = Rs.55

(ii) Gordon's formula (Dividend Growth model): When the growth is incorporated in earnings and dividend, the present value of market price per share (Po) is determined as follows:
Gordon's theory:

$$Po = \frac{E_1(1-b)}{Ke-br}$$

Where,
Po = Price per share
$E_1$ = Earnings per share
b = Retention ratio; (1 - b = Payout ratio)
Ke = Cost of capital

r = IRR
br = Growth rate (g)

$$Po = \frac{10\ (1-0.60)}{0.20 - (0.60 \times 0.25)} = \frac{4}{0.05} = Rs.80$$

**Q.25** Optimum Payout using Walter Model | RTP July 21

The following information is supplied to you:

| | (₹) |
|---|---|
| Total Earnings | 2,00,000 |
| No. of equity shares (of ₹ 100 each) | 20,000 |
| Dividend paid | 1,50,000 |
| Price/ Earnings ratio | 12.5 |

Applying Walter's Model:
(i) ANALYSE whether the company is following an optimal dividend policy.
(ii) COMPUTE P/E ratio at which the dividend policy will have no effect on the value of the share.
(iii) Will your decision change if the P/E ratio is 8 instead of 12.5? ANALYSE.

**Ans**

(i) The EPS of the firm is ₹ 10 (i.e., ₹ 2,00,000/ 20,000) and r = 2,00,000/ (20,000 shares× ₹100) = 10%. The P/E Ratio is given at 12.5 and the cost of capital, K e, may betaken at the inverse of P/E ratio. Therefore, Ke is 8 (i.e., 1/12.5). The firm is distributing total dividends of ₹ 1,50,000 among 20,000 shares, giving a dividend per share of₹ 7.50. the value of the share as per Walter's model may be found as follows:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e} = \frac{7.5 + \frac{0.1}{0.08}(10 - 7.5)}{0.08} = ₹\ 132.81$$

The firm has a dividend payout of 75% (i.e., ₹ 1,50,000) out of total earnings of₹ 2,00,000. Since, the rate of return of the firm, r, is 10% and it is more than the K e of 8%, therefore, by distributing 75% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be-

$$= \frac{0 + \frac{0.1}{0.08}(10 - 0)}{0.08} = ₹\ 156.25$$

So, theoretically the market price of the share can be increased by adopting a zero payout.

(ii) The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the Ke would be equal to the rate of return, r, of the firm. The Ke would be 10% (= r) at the P/E ratio of 10. Therefore, at the P/E ratio of 10, the dividend policy would have no effect on the value of the share.

(iii) If the P/E is 8 instead of 12.5, then the Ke which is the inverse of P/E ratio, would be12.5 and in such a situation ke> r and the market price, as per Walter's model would be:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e} = \frac{7.5 + \frac{0.1}{0.125}(10 - 7.5)}{0.125} = ₹\ 76$$

**Q.26** Optimum Payout using Walter Model | RTP May 20

Following information relating to Jee Ltd. is given:

| Particulars | |
|---|---|
| Profit after tax | ₹ 10,00,000 |
| Dividend pay-out ratio | 50% |
| Number of Equity Shares | 50,000 |
| Cost of Equity | 10% |
| Rate of Return on Investment | 12% |

(i) CALCULATE market value per share as per Walter's Model?

(ii) What is the optimum dividend pay-out ratio according to Walter's Model and Market value of equity share at that pay-out ratio?

**Ans**

(i) Walter's model is given by –

$$P = \frac{D + (E - D)(r / Ke)}{Ke}$$

Where,

P = Market price per share,

E = Earnings per share = ₹ 10,00,000 ÷ 50,000 = ₹ 20

D = Dividend per share = 50% of 20 = ₹ 10 r = Return earned on investment = 12%

Ke = Cost of equity capital = 10%

$$P = \frac{10 + (20 - 10)x\frac{22}{0.10}}{0.10} = \frac{22}{0.10} = ₹ 220$$

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is Nil. So, at a pay-out ratio of zero, the market value of the company's share will be:

$$= \frac{0 + (20 - 0)x\frac{0.12}{0.10}}{0.10} = \frac{24}{0.10} = ₹ 240$$

**Q.27** Optimum Payout using Walter Model | RTP Nov 19

The following information pertains to SD Ltd.

| | |
|---|---|
| Earnings of the Company | ₹ 50,00,000 |
| Dividend Payout ratio | 60% |
| No. of shares outstanding | 10,00,000 |
| Equity capitalization rate | 12% |
| Rate of return on investment | 15% |

(i) COMPUTE the market value per share as per Walter's model?

(ii) COMPUTE the optimum dividend payout ratio according to Walter's model and the market value of Company's share at that payout ratio?

**Ans**

(i) Walter's model is given by

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

Where

P = Market price per share.
E = Earnings per share = ₹ 5
D = Dividend per share = ₹ 3
R = Return earned on investment = 15% Ke = Cost of equity capital = 12%

$$P = \frac{3+\frac{0.15}{0.12}(5-3)}{0.12} = ₹\ 45.83$$

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.
So, at a pay-out ratio of zero, the market value of the company's share will be:

$$P = \frac{0+\frac{0.15}{0.12}(5-0)}{0.12} = = ₹52.08$$

**Q.28** Optimum Payout using Walter Model | RTP May 18

The following information relates to Navya Ltd:

| | |
|---|---|
| Earnings of the company | ₹ 20,00,000 |
| Dividend pay-out ratio | 60% |
| No. of Shares outstanding | 4,00,000 |
| Rate of return on investment | 15% |
| Equity capitalization rate | 12% |

Required:

(i) DETERMINE what would be the market value per share as per Walter's model.
(ii) COMPUTE optimum dividend pay-out ratio according to Walter's model and the market value of company's share at that pay-out ratio.

**Ans** Navya Ltd.

(i) Walter's model is given by –

$$P = \frac{D + (E - D)(r / Ke)}{Ke}$$

Where,
P = Market price per share,
E = Earnings per share = ₹20,00,000 ÷ 4,00,000 = ₹ 5
D = Dividend per share = 60% of 5 = ₹ 3
r = Return earned on investment = 15%
Ke = Cost of equity capital = 12%

$$P = \frac{3+(5-3)x\frac{0.15}{0.12}}{0.12} = \frac{3+2x\frac{0.15}{0.12}}{0.12} = ₹\ 45.83$$

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is Nil. So, at a payout ratio of zero, the market value of the company's share will be:-

$$= \frac{0+(5-0)x\frac{0.15}{0.12}}{0.12} = ₹\ 52.08$$

**Q.29** Optimum Payout using Walter Model | MTP May 22(1)

The following figures have been extracted from the annual report of Xee Ltd.:

| | |
|---|---|
| Net Profit | ₹ 75 lakhs |
| Outstanding 12% preference shares | ₹ 250 lakhs |
| No. of equity shares | 3 lakhs |
| Return on Investment | 20% |
| Cost of capital i.e. (Ke) | 16% |

COMPUTE the approximate dividend pay-out ratio so as to keep the share price at ₹ 105 by using Walter's model?

**Ans**

| Particulars | (₹' in lakhs) |
|---|---|
| Net Profit | 75 |
| Less: Preference dividend | 30 |
| Earnings for equity shareholders | 45 |
| Earnings per share | 45/3 = ₹ 15 |

Let, the dividend per share be D to get share price of ₹ 105

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

$$105 = \frac{D + \frac{0.20}{0.16}(15 - D)}{0.16}$$

$$16.8 = \frac{0.16D + 3 - 0.20D}{0.16}$$

$$0.04D = 3 - 2.688$$

$$D = 7.80$$

$$\text{D/P ratio} = \frac{DPS}{EPS} \times 100 = \frac{7.80}{15} \times 100 = 52\%$$

So, the required dividend pay-out ratio will be = 52%

**Q.30** Optimum Payout using Walter Model | MTP Dec 21(2)

The following information is supplied to you:

| Particulars | ₹ |
|---|---|
| Total Earnings | 5,00,000 |
| Equity shares (of ₹ 100 each) | 50,00,000 |
| Dividend paid | 3,75,000 |
| Price/ Earnings ratio | 12.5 |

Applying Walter's Model:

(i) ANALYSE whether the company is following an optimal dividend policy.

(ii) COMPUTE P/E ratio at which the dividend policy will have no effect on the value of the share.

(iii) Will your decision change, if the P/E ratio is 8 instead of 12.5? ANALYSE.

**Ans**

(i) The EPS of the firm is ₹ 10 (i.e. ₹ 5,00,000/ 50,000). r = 5,00,000/ 50,00,000 = 10%The P/E Ratio is given at 12.5 and the cost of capital, Ke, may be taken at the inverseof P/E ratio. Therefore, Ke is 8 (i.e., 1/12.5).

The firm is distributing total dividends of₹ 3,75,000 among 50,000 shares, giving a dividend per share of ₹ 7.50. The value ofthe share as per Walter's model may be found as follows:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e} = \frac{7.5 + \frac{0.1}{0.08}(10 - 7.5)}{0.08} = ₹\ 132.81$$

The firm has a dividend payout of 75% (i.e., ₹ 3,75,000) out of total earnings of₹ 5,00,000. Since, the rate of return of the firm, r, is 10% and it is more than the Ke of8%, therefore, by distributing 75% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be,

$$= \frac{0 + \frac{0.1}{0.08}(10 - 0)}{0.08} = ₹\ 156.25$$

So, theoretically, the market price of the share can be increased by adopting a zero payout.

(ii) The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the Ke would be equal to the rate of return, r, of the firm. The Ke would be 10% (= r) at the P/E ratio of 10. Therefore, at the P/E ratio of 10, the dividend policy would have no effect on the value of the share.

(iii) If the P/E is 8 instead of 12.5, then the Ke which is the inverse of P/E ratio, would be12.5 and in such a situation ke> r and the market price, as per Walter's model would be:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e} = \frac{7.5 + \frac{0.1}{0.125}(10 - 7.5)}{0.125} = ₹\ 76$$

# 7 CHAPTER
# CASH MANAGEMENT

**Q.1** REORDER INVENTORY LEVEL | PY May 22

A company requires 36,000 units of a product per year at cost of ₹ 100 per unit. Ordering cost per order is ₹ 250 and the carrying cost is 4.5% per year of the inventory cost. Normal lead time is 25 days and safety stock is NIL. Assume 360 working days in a year.

(i) Calculate the Reorder Inventory Level.
(ii) Calculate the Economic Order Quantity (EOQ).
(iii) If the supplier offers 1% quantity discount for purchase in lots of 9,000 units or more, should the company accept the proposal?

**Ans.**

Annual Consumption = 36,000 (A)
Ordering Cost = ₹ 250 per order (O)
Carrying Cost = $\frac{4.5}{100} \times 100$
= ₹ 4.5 (C) Lead Time
= 25 days

**(i) Reorder Level** = Lead Time × Daily Consumption
$= 25 \times \frac{36,000}{360}$
= **2,500 units**

**(ii) Economic Order Quantity (EOQ)**

$$= \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 36,000 \times 250}{4.5}}$$

= 2,000 units

**(iii) Evaluation of Profitability of Quantity Discount Offer:**

**(a) When EOQ is ordered**

| | | (₹) |
|---|---|---|
| Purchase Cost | (36,000 units x ₹ 100) | 36,00,000 |
| Ordering Cost | [(36,000 units/2,000 units) x ₹ 250] | 4,500 |
| Carrying Cost | (2,000 units x ½ x ₹ 4.5) | 4,500 |
| **Total Cost** | | **36,09,000** |

**(b) When Quantity Discount is accepted**

| | | (₹) |
|---|---|---|
| Purchase Cost | (36,000 units x ₹ 99*) | 35,64,000 |
| Ordering Cost | [(36,000 units/9,000 units) x ₹ 250] | 1,000 |
| Carrying Cost | (9,000 units x ½ x ₹ 99 x 4.5%) | 20,048 |
| **Total Cost** | | **35,85,048** |

*Unit Cost = ₹100
Less: Quantity Discount @ 1% = ₹ 1
Purchase Cost = ₹ 99

Advise – The total cost of inventory is lower if Quantity Discount is accepted. Hence, the company is advised to accept the proposal.

**Q.2** Optimum Cash Balance | PY Nov 22

K Ltd. has a Quarterly cash outflow of ₹ 9,00,000 arising uniformly during the Quarter.
The company has an Investment portfolio of Marketable Securities. It plans to meet the demands for cash by periodically selling marketable securities. The marketable securities are generating a return of 12% p.a. Transaction cost of converting investments to cash is ₹ 60. The company uses Baumol model to find out the optimal transaction size for converting marketable securities into cash. Consider 360 days in a year.
You are required to calculate
(i) Company's average cash balance,
(ii) Number of conversions each year and
(iii) Time interval between two conversions.

**Ans.**

**(i) Computation of Average Cash balance:**

Annual cash outflow (U) = 9,00,000 x 4 = ₹ 36,00,000
Fixed cost per transaction (P) = ₹ 60
Opportunity cost of one rupee p.a. (S) = $\frac{12}{100} = 0.12$
Optimum cash balance (C) = $\sqrt{\frac{2UP}{S}} = \sqrt{\frac{2'36,00,000'60}{0.12}}$ = ₹ 60,000
∴ Average Cash balance = $\frac{(0 + 60,000)}{2}$ = ₹ 30,000

**(ii) Number of conversions p.a.**

Annual cash outflow = ₹ 36,00,000
Optimum cash balance = ₹ 60,000
∴ No. of conversions p.a. = $\frac{36,00,000}{60,000} = 60$

**(iii) Time interval between two conversions**

No. of days in a year = 360
No. of conversions p.a. = 60
∴ Time interval = $\frac{360}{60}$ = 6 days

**Q.3** Cash Budget | PY Dec 21

A garment trader is preparing cash forecast for first three months of calendar year 2021.
His estimated sales for the forecasted periods are as below:

| | *January (₹ '000)* | *February (₹ '000)* | *March (₹ '000)* |
|---|---|---|---|
| *Total sales* | *600* | *600* | *800* |

(i) The trader sells directly to public against cash payments and to other entities on credit. Credit sales are expected to be four times the value of direct sales to public. He expects 15% customers to pay in the month in which credit sales are made, 25% to pay in the next month and 58% to pay in the next to next month. The outstanding balance is expected to be written off.
(ii) Purchases of goods are made in the month prior to sales and it amounts to 90% of sales and are made on credit. Payments of these occur in the month after the purchase. No inventories of goods are held.
(iii) Cash balance as on 1st January, 2021 is ₹ 50,000.
(iv) Actual sales for the last two months of calendar year 2020 are as below:

| | November (₹ '000) | December (₹ '000) |
|---|---|---|
| *Total sales* | *640* | *880* |

You are required to prepare a monthly cash, budget for the three months from January to March, 2021

**Ans.** **(1)** **Calculation of cash and credit sales** **(₹ in thousands)**

| | Nov. | Dec. | Jan. | Feb. | Mar. |
|---|---|---|---|---|---|
| Total Sales | 640 | 880 | 600 | 600 | 800 |
| Cash Sales (1/5th of total | 128 | 176 | 120 | 120 | 160 |
| Credit Sales (4/5th of total | 512 | 704 | 480 | 480 | 640 |

**(2)** **Calculation of Credit Sales Receipts**

| **Month** | **Nov.** | **Dec.** | **Jan.** | **Feb.** | **Mar.** |
|---|---|---|---|---|---|
| Forecast Credit sales (Working note 1) | 512.00 | 704.00 | 480.00 | 480.00 | 640.00 |
| Receipts: | | | | | |
| 15% in the month of sales | | | **72.00** | **72.00** | **96.00** |
| 25% in next month | | | **176.00** | **120.00** | **120.00** |
| 58% in next to next month | | | **296.96** | **408.32** | **278.40** |
| **Total** | | | 544.96 | 600.32 | 494.40 |

**Cash Budget** **(₹ithousands)**

| | Nov. | Dec. | Jan. | Feb. | Mar. |
|---|---|---|---|---|---|
| Opening Balance **(A)** | | | 50.00 | 174.96 | 355.28 |
| Sales | 640.00 | 880.00 | 600.00 | 600.00 | 800.00 |
| **Receipts:** | | | | | |
| Cash Collection (Working note 1) | | | 120.00 | 120.00 | 160.00 |
| Credit Collections (Working note 2) | | | 544.96 | 600.32 | 494.40 |
| Total **(B)** | | | 664.96 | 720.32 | 654.40 |
| Purchases (90% of sales in the prior to sales) | | 540 | 540 | 720 | |
| **Payments:** | | | | | |
| Payment for purchases (next month) | | | **540** | **540** | **720** |
| Total **(C)** | | | 540 | 540 | 720 |
| Closing balance**(D) = (A + B – C)** | | | 174.96 | 355.28 | **289.68** |

**Q.4** Monthly Cash Budget | RTP Nov 22

A company was incorporated w.e.f. 1st April, 2021. Its authorised capital was ₹ 1,00,00,000 divided into 10 lakh equity shares of ₹ 10 each. It intends to raise capital by issuing equity shares of ₹ 50,00,000 (fully paid) on 1st April. Besides this, a loan of ₹ 6,50,000 @ 12% per annum will be obtained from a financial institution on 1st April and further borrowings will be made at same rate of interest on the first day of the month in which borrowing is required. All borrowings will be repaid along with interest on the expiry of one year. The company will make payment for the following assets in April.

| **Particulars** | (₹) |
|---|---|
| Plant and Machinery | 10,00,000 |

| | |
|---|---|
| Land and Building | 20,00,000 |
| Furniture | 5,00,000 |
| Motor Vehicles | 5,00,000 |
| Stock of Raw Materials | 5,00,000 |

The following further details are available:

(1) Projected Sales (April-September):

| | (₹) |
|---|---|
| April | 15,00,000 |
| May | 17,50,000 |
| June | 17,50,000 |
| July | 20,00,000 |
| August | 20,00,000 |
| September | 22,50,000 |

(2) Gross profit margin will be 25% on sales.
(3) The company will make credit sales only and these will be collected in the second month following sales
(4) Creditors will be paid in the first month following credit purchases. There will be credit purchases only.
(5) The company will keep minimum stock of raw materials of ₹ 5,00,000.
(6) Depreciation will be charged @ 10% per annum on cost on all fixed assets.
(7) Payment of miscellaneous expenses of ₹ 50,000 will be made in April.
(8) Wages and salaries will be ₹ 1,00,000 each month and will be paid on the first day of the next month.
(9) Administrative expenses of ₹ 50,000 per month will be paid in the month of their incurrence.
(10) No minimum cash balance is required.

You are required to PREPARE the monthly cash budget (April-September), the projected Income Statement for the 6 months period and the projected Balance Sheet as on 30th September, 2021.

**Ans.**

**Monthly Cash Budget (April-September)** (₹)

| | April | May | June | July | August | September |
|---|---|---|---|---|---|---|
| Opening cash balance | - | 10,50,000 | - | 1,37,500 | 5,25,000 | 7,25,000 |
| **A. Cash inflows** | | | | | | |
| Equity shares | 50,00,000 | - | - | - | - | - |
| Loans (Refer to working note 1) | 6,50,000 | 1,25,000 | - | - | - | - |
| Receipt from debtors | - | - | 15,00,000 | 17,50,000 | 17,50,000 | 20,00,000 |
| Total (A) | 56,50,000 | 11,75,000 | 15,00,000 | 18,87,500 | 22,75,000 | 27,25,000 |
| **B. Cash Outflows** | | | | | | |
| Plant and Machinery | 10,00,000 | - | - | - | - | - |
| Land and Building | 20,00,000 | - | - | - | - | - |
| Furniture | 5,00,000 | - | - | - | - | - |
| Motor Vehicles | 5,00,000 | - | - | - | - | - |
| Stock of raw materials (Minimum stock) | 5,00,000 | - | - | - | - | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Miscellaneous expenses | 50,000 | - | - | - | - | - |
| Payment to creditors for credit purchases (Refer to working note 2) | - | 10,25,000 | 12,12,500 | 12,12,500 | 14,00,000 | 14,00,000 |
| Wages and salaries | - | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 |
| Admn. expenses | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 |
| Total :(B) | 46,00,000 | 11,75,000 | 13,62,500 | 13,62,500 | 15,50,000 | 15,50,000 |
| Closing balance (A)-(B) | 10,50,000 | - | 1,37,500 | 5,25,000 | 7,25,000 | 11,75,000 |

**Budgeted Income Statement for six-month period ending 30th September**

| Particulars | (₹) | Particulars | (₹) |
|---|---|---|---|
| To Purchases | 83,37,500 | By Sales | 1,12,50,000 |
| To Wages and Salaries | 6,00,000 | By Closing stock | 5,00,000 |
| To Gross profit c/d | 28,12,500 | | |
| | **1,17,50,000** | | **1,17,50,000** |
| To Admn. expenses | 3,00,000 | By Gross profit b/d | 28,12,500 |
| To Depreciation | 2,00,000 | | |
| To Accrued interest on loan | 45,250 | | |
| To Miscellaneous expenses | 50,000 | | |
| To Net profit c/d | 22,17,250 | | |
| | **28,12,500** | | **28,12,500** |

**Projected Balance Sheet as on 30th September, 2021**

| Liabilities | | Amount (₹) | Assets | | | Amount (₹) |
|---|---|---|---|---|---|---|
| Share Capital: | | | Fixed Assets: | | | |
| Authorised capital 10,00,000 equity shares of ₹10 each | | 1,00,00,000 | Land and Building | 20,00,000 | | |
| | | | *Less:* Depreciation | 1,00,000 | 19,00,000 | |
| | | | Plant and Machinery | 10,00,000 | | |
| | | | *Less:* Depreciation | 50,000 | 9,50,000 | |
| Issued, Subscribed and Paid up capital 5,00,000 equity Shares of ₹10 each | | 50,00,000 | Furniture | 5,00,000 | | |
| | | | *Less:* Depreciation | 25,000 | 4,75,000 | |
| | | | Motor Vehicles | 5,00,000 | | |
| | | | *Less:* Depreciation | 25,000 | 4,75,000 | 38,00,000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | Current Assets: | | | |
| Reserve and Surplus: | | | Stock | | 5,00,000 | |
| | | | Sundry debtors | | 42,50,000 | |
| Profit and Loss | | 22,17,250 | Cash | | 11,75,000 | 59,25,000 |
| Long-term loans | | 7,75,000 | | | | |
| Current liabilities and provisions: | | | | | | |
| Sundry creditors | 15,87,500 | | | | | |
| Accrued interest | 45,250 | | | | | |
| Outstanding expenses | 1,00,000 | 17,32,750 | | | | 97,75,000 |
| | | 97,75,000 | | | | |

**Working Notes:**

Subsequent Borrowings Needed (₹)

| | April | May | June | July | August | September |
|---|---|---|---|---|---|---|
| **A. Cash Inflow** | | | | | | |
| Equity shares | 50,00,000 | | | | | |
| Loans | 6,50,000 | | | | | |
| Receipt from debtors | - | - | 15,00,000 | 17,50,000 | 17,50,000 | 20,00,000 |
| Total (A) | 56,50,000 | - | 15,00,000 | 17,50,000 | 17,50,000 | 20,00,000 |
| **B. Cash Outflow** | | | | | | |
| Purchase of fixed assets | 40,00,000 | | | | | |
| Stock | 5,00,000 | | | | | |
| Miscellaneous expenses | 50,000 | | | | | |
| Payment to creditors | - | 10,25,000 | 12,12,500 | 12,12,500 | 14,00,000 | 14,00,000 |
| Wages and salaries | - | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 |
| Administrative expenses | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 |
| Total | 46,00,000 | 11,75,000 | 13,62,500 | 13,62,500 | 15,50,000 | 15,50,000 |
| Surplus/ (Deficit) | 10,50,000 | (11,75,000) | 1,37,500 | 3,87,500 | 2,00,000 | 4,50,000 |
| Cumulative balance | 10,50,000 | (1,25,000) | 12,500 | 4,00,000 | 6,00,000 | 10,50,000 |

1. There is shortage of cash in May of ₹ 1,25,000 which will be met by borrowings in May.
2. Payment to Creditors
   Purchases = Cost of goods sold - Wages and salaries
   Purchases for April = (75% of 15,00,000) - ₹ 1,00,000 = ₹ 10,25,000

(Note: Since gross margin is 25% of sales, cost of manufacture i.e. materials plus wages and salaries should be 75% of sales)
Hence, Purchases = Cost of manufacture minus wages and salaries of ₹ 1,00,000)
The creditors are paid in the first month following purchases.
Therefore, payment in May is ₹ 10,25,000
The same procedure will be followed for other months.

| | | | | |
|---|---|---|---|---|
| April | (75% of 15,00,000) | - ₹ 1,00,000 | = | ₹ 10,25,000 |
| May | (75% of 17,50,000) | - ₹ 1,00,000 | = | ₹ 12,12,500 |
| June | (75% of 17,50,000) | - ₹ 1,00,000 | = | ₹ 12,12,500 |
| July | (75% of 20,00,000) | - ₹ 1,00,000 | = | ₹ 14,00,000 |
| August | (75% of 20,00,000) | - ₹ 1,00,000 | = | ₹ 14,00,000 |
| September | (75% of 22,50,000) | - ₹ 1,00,000 | = | ₹ 15,87,500 |
| Minimum Stock | | | | ₹ 5,00,000 |
| Total Purchases | | | | ₹ 83,37,500 |

**3.** Accrued Interest on Loan

| | |
|---|---|
| 12% interest on ₹ 6,50,000 for 6 months | 39,000 |
| Add: 12% interest on ₹ 1,25,000 for 5 months | 6,250 |
| | 45,250 |

**Q.5** Cash Budget in next 3 years | RTP May 22

You are given below the Profit & Loss Accounts for two years for a company:

**Profit and Loss Account**

| | Year 1 | Year 2 | | Year 1 | Year 2 |
|---|---|---|---|---|---|
| | (₹) | (₹) | | (₹) | (₹) |
| To Opening stock | 32,00,000 | 40,00,000 | By Sales | 3,20,00,000 | 4,00,00,000 |
| To Raw materials | 1,20,00,000 | 1,60,00,000 | By Closing stock | 40,00,000 | 60,00,000 |
| To Stores | 38,40,000 | 48,00,000 | By Misc. Income | 4,00,000 | 4,00,000 |
| To Manufacturing Expenses | 51,20,000 | 64,00,000 | | | |
| To Other Expenses | 40,00,000 | 40,00,000 | | | |
| To Depreciation | 40,00,000 | 40,00,000 | | | |
| To Net Profit | 42,40,000 | 72,00,000 | | - | - |
| | **3,64,00,000** | **4,64,00,000** | | **3,64,00,000** | **4,64,00,000** |

Sales are expected to be ₹ 4,80,00,000 in year 3.
As a result, other expenses will increase by ₹ 20,00,000 besides other charges. Only raw materials are in stock. Assume sales and purchases are in cash terms and the closing stock is expected to go up by the same amount as between year 1 and 2. You may assume that no dividend is being paid. The Company can use 75% of the cash generated to service a loan. COMPUTE how much cash from operations will be available in year 3 for the purpose? Ignore income tax.

**Ans.** **Projected Profit and Loss Account for the year 3**

| Particulars | Year 2 Actual (₹ in lakhs) | Year 3 Projected (₹ in lakhs) | Particulars | Year 2 Actual (₹ in lakhs) | Year 3 Projected (₹ in lakhs) |
|---|---|---|---|---|---|
| To Materials consumed | 140.00 | 168.00 | By Sales | 400.00 | 480.00 |

| | | | | | |
|---|---|---|---|---|---|
| To Stores | 48.00 | 57.60 | By Misc. Income | 4.00 | 4.00 |
| To Mfg. Expenses | 64.00 | 76.80 | | | |
| To Other expenses | 40.00 | 60.00 | | | |
| To Depreciation | 40.00 | 40.00 | | | |
| To Net profit | 72.00 | 81.60 | | | |
| | **404.00** | **484.00** | | **484.00** | **484.00** |

**Cash Flow:**

| **Particulars** | **(₹ in lakhs)** |
|---|---|
| Profit | 81.60 |
| Add: Depreciation | 40.00 |
| | 121.60 |
| Less: Cash required for increase in stock | 20.00 |
| **Net cash inflow** | **101.60** |

Available for servicing the loan: 75% of ₹ 1,01,60,000 or ₹ 76,20,000

Working Notes:

(i) Material consumed in year 1 = (32 + 120 – 40)/320 = 35%
Material consumed in year 2 = (40 + 160 – 60)/400 = 35%
Likely consumption in year 3 = $480 \times \frac{35}{100}$ = ₹ 168 (lakhs)

(ii) Stores are 12% of sales & Manufacturing expenses are 16% of sales for both the years.

**Q.6** Monthly Cash Budget | MTP May 23(1)

You are given the following information:

(i) Estimated monthly Sales are as follows:

| | ₹ | | ₹ |
|---|---|---|---|
| January | 5,50,000 | June | 4,40,000 |
| February | 6,60,000 | July | 5,50,000 |
| March | 7,70,000 | August | 4,40,000 |
| April | 4,40,000 | September | 3,30,000 |
| May | 3,30,000 | October | 5,50,000 |

(ii) Wages and Salaries are estimated to be payable as follows:

| | ₹ | | ₹ |
|---|---|---|---|
| April | 49,500 | July | 55,000 |
| May | 44,000 | August | 49,500 |
| June | 55,000 | September | 49,500 |

(iii) Of the sales, 75% is on credit and 25% for cash. 60% of the credit sales are collected within one month and the balance in two months. There are no bad debt losses.

(iv) Purchases amount to 75% of sales and are made and paid for in the month preceding the sales.

(v) The firm has taken a loan of ₹6,00,000. Interest @ 12% p.a. has to be paid quarterly in January, April and so on.

(vi) The firm is to make payment of tax of ₹26,000 in July 2023.

(vii) The firm had a cash balance of ₹35,000 on 1St April 2023 which is the minimum desired level of cash balance. Any cash surplus/deficit above/below this level is made up by temporary investments/liquidation of temporary investments or temporary borrowings at the end of each month (interest on these to be ignored).
Required:
PREPARE monthly cash budgets for six months beginning from April, 2023 on the basis of the above information.

**Ans.**

**Computation – Collections from Customers**

| Particulars | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|
| | (₹) | (₹) | (₹) | (₹) | (₹) | (₹) | (₹) | (₹) |
| Total Sales | 6,60,000 | 7,70,000 | 4,40,000 | 3,30,000 | 4,40,000 | 5,50,000 | 4,40,000 | 3,30,000 |
| Credit Sales (75% of total Sales) | 4,95,000 | 5,77,500 | 3,30,000 | 2,47,500 | 3,30,000 | 4,12,500 | 3,30,000 | 2,47,500 |
| Collection (within one month) | | 2,97,000 | 3,46,500 | 1,98,000 | 1,48,500 | 1,98,000 | 2,47,500 | 1,98,000 |
| Collection (within two months) | | | 1,98,000 | 2,31,000 | 1,32,000 | 99,000 | 1,32,000 | 1,65,000 |
| **Total Collections** | | | **5,44,500** | **4,29,000** | **2,80,500** | **2,97,000** | **3,79,500** | **3,63,000** |

**Monthly Cash Budget for Six Months: April to September 2023**

| Particulars | April | May | June | July | August | Sept. |
|---|---|---|---|---|---|---|
| | (₹) | (₹) | (₹) | (₹) | (₹) | (₹) |
| **Receipts:** | | | | | | |
| Opening Balance | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 |
| Cash Sales | 1,10,000 | 82,500 | 1,10,000 | 1,37,500 | 1,10,000 | 82,500 |
| Collections from Debtors | 5,44,500 | 4,29,000 | 2,80,500 | 2,97,000 | 3,79,500 | 3,63,000 |
| **Total Receipts (A)** | **6,89,500** | **5,46,500** | **4,25,500** | **4,69,500** | **5,24,500** | **4,80,500** |
| **Payments:** | | | | | | |
| Purchases | 2,47,500 | 3,30,000 | 4,12,500 | 3,30,000 | 2,47,500 | 4,12,500 |
| Wages and Salaries | 49,500 | 44,000 | 55,000 | 55,000 | 49,500 | 49,500 |
| Interest on Loan | 18,000 | ----- | ----- | 18,000 | ----- | ----- |
| Tax Payment | ----- | ----- | ----- | 26,000 | ----- | ----- |
| **Total Payment (B)** | **3,15,000** | **3,74,000** | **4,67,500** | **4,29,000** | **2,97,000** | **4,62,000** |
| Minimum Cash Balance | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 |
| **Total Cash Required (C)** | **3,50,000** | **4,09,000** | **5,02,500** | **4,64,000** | **3,32,000** | **4,97,000** |
| Surplus/ (Deficit) (A)-(C) | 3,39,500 | 1,37,500 | -77,000 | 5,500 | 1,92,500 | -16,500 |
| Investment/Financing: | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total effect of (Invest)/ Financing (D) | -3,39,500 | -1,37,500 | 77,000 | -5,500 | -1,92,500 | 16,500 |
| Closing Cash Balance (A) + (D) - (B) | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 |

**Q.7** Monthly Cash Budget | MTP May 21(1)

PREPARE monthly cash budget for the first six months of 2021 on the basis of the following information:

(i) Actual and estimated monthly sales are as follows:

| Actual | (Rs.) | Estimated | (Rs.) |
|---|---|---|---|
| October 2020 | 2,00,000 | January 2021 | 60,000 |
| November 2020 | 2,20,000 | February 2021 | 80,000 |
| December 2020 | 2,40,000 | March 2021 | 1,00,000 |
| | | April 2021 | 1,20,000 |
| | | May 2021 | 80,000 |
| | | June 2021 | 60,000 |
| | | July 2021 | 1,20,000 |

(ii) Operating Expenses (including salary & wages) are estimated to be payable as follows:

| Month | (Rs.) | Month | (Rs.) |
|---|---|---|---|
| January 2021 | 22,000 | April 2021 | 30,000 |
| February 2021 | 25,000 | May 2021 | 25,000 |
| March 2021 | 30,000 | June 2021 | 24,000 |

(iii) Of the sales, 75% is on credit and 25% for cash. 60% of the credit sales are collected after one month, 30% after two months and 10% after three months.

(iv) Purchases amount to 80% of sales and are made on credit and paid for in the month preceding the sales.

(v) The firm has 12% debentures of Rs.1,00,000. Interest on these has to be paid quarterly in January, April and so on.

(vi) The firm is to make an advance payment of tax of Rs. 5,000 in April.

(vii) The firm had a cash balance of Rs. 40,000 at 31st Dec. 2020, which is the minimum desired level of cash balance. Any cash surplus/deficit above/below this level is made up by temporary investments/liquidation of temporary investments or temporary borrowings at the end of each month (interest on these to be ignored).

**Ans.** **Monthly Cash Budget for first six months of 2021**

**(Amount in Rs.)**

| Particulars | Jan. | Feb. | Mar. | April | May | June |
|---|---|---|---|---|---|---|
| Opening balance | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 |
| **Receipts:** | | | | | | |
| Cash sales | 15,000 | 20,000 | 25,000 | 30,000 | 20,000 | 15,000 |
| Collection from debtors | 1,72,500 | 97,500 | 67,500 | 67,500 | 82,500 | 70,500 |
| Total cash available (A) | 2,27,500 | 1,57,500 | 1,32,500 | 1,37,500 | 1,42,500 | 1,25,500 |
| **Payments:** | | | | | | |
| Purchases | 64,000 | 80,000 | 96,000 | 64,000 | 48,000 | 96,000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Operating Expenses | 22,000 | 25,000 | 30,000 | 30,000 | 25,000 | 24,000 |
| Interest on debentures | 3,000 | - | - | 3,000 | - | - |
| Tax payment | - | - | - | 5,000 | - | - |
| Total payments (B) | 89,000 | 1,05,000 | 1,26,000 | 1,02,000 | 73,000 | 1,20,000 |
| Minimum cash balance desired | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 |
| Total cash needed (C) | 1,29,000 | 1,45,000 | 1,66,000 | 1,42,000 | 1,13,000 | 1,60,000 |
| Surplus/(deficit) (A - C) | 98,500 | 12,500 | (33,500) | (4,500) | 29,500 | (34,500) |
| **Investment/financing** | | | | | | |
| Temporary Investments | (98,500) | (12,500) | - | - | (29,500) | - |
| Liquidation of temporary investments or temporary borrowings | | | 33,500 | 4,500 | - | 34,500 |
| Total effect of investment/financing(D) | (98,500) | (12,500) | 33,500 | 4,500 | (29,500) | 34,500 |
| Closing cash balance (A + D - B) | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 |

**Workings:**

**1. Collection from debtors:** **(Amount in Rs.)**

| | Year 2020 | | | Year 2021 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May | June |
| Total sales | 2,00,000 | 2,20,00 | 2,40,00 | 60,00 | 80,000 | 1,00,00 | 1,20,000 | 80,000 | 60,000 |
| Credit sales (75% of total sales) | 1,50,000 | 1,65,00 | 1,80,00 | 45,00 | 60,000 | 75,00 | 90,000 | 60,000 | 45,000 |
| Collections: | | | | | | | | | |
| One month | | 90,00 | 99,00 | 1,08,00 | 27,000 | 36,00 | 45,000 | 54,000 | 36,000 |
| Two months | | 0 | 45,00 | 49,50 | 54,000 | 13,500 | 18,000 | 22,500 | 27,000 |
| Three months | | | | 15,000 | 16,500 | 18,000 | 4,500 | 6,000 | 7,500 |
| **Total collections** | | | | **1,72,5** | **97,500** | **67,50** | **67,500** | **82,500** | **70,500** |

**2. Payment to Creditors:** **(Amount in Rs.)**

| | Year 2021 | | | | | | |
|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul |
| Total sales | 60,000 | 80,000 | 1,00,000 | 1,20,000 | 80,000 | 60,000 | 1,20,000 |
| Purchases (80% of total sales) | 48,000 | 64,000 | 80,000 | 96,000 | 64,000 | 48,000 | 96,000 |
| **Payment:** | | | | | | | |
| **One month prior** | **64,000** | **80,000** | **96,000** | **64,000** | **48,000** | **96,000** | |

**Q.8** Monthly Cash Budget | MTP Nov 19

You are given the following information:

(i) Estimated monthly Sales are as follows:

(ii)

| | Rs. | | Rs. |
|---|---|---|---|
| January | 1,00,000 | June | 80,000 |
| February | 1,20,000 | July | 1,00,000 |
| March | 1,40,000 | August | 80,000 |
| April | 80,000 | September | 60,000 |
| May | 60,000 | October | 1,00,000 |

(ii) Wages and Salaries are estimated to be payable as follows:

| | Rs. | | Rs. |
|---|---|---|---|
| April | 9,000 | July | 10,000 |
| May | 8,000 | August | 9,000 |
| June | 10,000 | September | 9,000 |

(iii) Of the sales, 80% is on credit and 20% for cash. 75% of the credit sales are collected within one month and the balance in two months. There are no bad debt losses.

(iv) Purchases amount to 80% of sales and are made and paid for in the month preceding the sales.

(v) The firm has taken a loan of Rs.1,20,000. Interest @ 10% p.a. has to be paid quarterly in January, April and so on.

(vi) The firm is to make payment of tax of Rs. 5,000 in July, 2019.

(vii) The firm had a cash balance of Rs. 20,000 on 1St April, 2019 which is the minimum desired level of cash balance. Any cash surplus/deficit above/below this level is made up by tempora ry investments/liquidation of temporary investments or temporary borrowings at the end of each month (interest on these to be ignored).

Required

PREPARE monthly cash budgets for six months beginning from April, 2019 on the basis of the above information.

**Ans.**

**Computation – Collections from Debtors**

| Particulars | Feb (Rs.) | Mar (Rs.) | Apr (Rs.) | May (Rs.) | Jun (Rs.) | Jul (Rs.) | Aug (Rs.) | Sep (Rs.) |
|---|---|---|---|---|---|---|---|---|
| Total Sales | 1,20,000 | 1,40,000 | 80,000 | 60,000 | 80,000 | 1,00,000 | 80,000 | 60,000 |
| Credit Sales (80% of total Sales) | 96,000 | 1,12,000 | 64,000 | 48,000 | 64,000 | 80,000 | 64,000 | 48,000 |
| Collection (within one month) | | 72,000 | 84,000 | 48,000 | 36,000 | 48,000 | 60,000 | 48,000 |
| Collection (within two months) | | | 24,000 | 28,000 | 16,000 | 12,000 | 16,000 | 20,000 |
| Total Collections | | | 1,08,000 | 76,000 | 52,000 | 60,000 | 76,000 | 68,000 |

**Monthly Cash Budget for Six Months: April to September, 2019**

| Particulars | April (Rs.) | May (Rs.) | June (Rs.) | July (Rs.) | August (Rs.) | Sept. (Rs.) |
|---|---|---|---|---|---|---|
| Receipts: | | | | | | |
| Opening Balance | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Cash Sales | 16,000 | 12,000 | 16,000 | 20,000 | 16,000 | 12,000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Collections from Debtors | 1,08,000 | 76,000 | 52,000 | 60,000 | 76,000 | 68,000 |
| Total Receipts (A) | 1,44,000 | 1,08,000 | 88,000 | 1,00,000 | 1,12,000 | 1,00,000 |
| Payments: | | | | | | |
| Purchases | 48,000 | 64,000 | 80,000 | 64,000 | 48,000 | 80,000 |
| Wages and Salaries | 9,000 | 8,000 | 10,000 | 10,000 | 9,000 | 9,000 |
| Interest on Loan | 3,000 | ----- | ----- | 3,000 | ----- | ----- |
| Tax Payment | ----- | ----- | ----- | 5,000 | ----- | ----- |
| Total Payment (B) | 60,000 | 72,000 | 90,000 | 82,000 | 57,000 | 89,000 |
| Minimum Cash Balance | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Total Cash Required (C) | 80,000 | 92,000 | 1,10,000 | 1,02,000 | 77,000 | 1,09,000 |
| Surplus/ (Deficit) (A)-(C) | 64,000 | 16,000 | (22,000) | (2,000) | 35,000 | (9,000) |
| Investment/Financing: Total effect of (Invest)/ Financing (D) | (64,000) | (16,000) | 22,000 | 2,000 | (35,000) | 9,000 |
| Closing Cash Balance (A) + (D) - (B) | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |

# 8 CHAPTER DEBTORS MANAGEMENT

**Q.1** Accept Factoring or Not | MTP May 19(2)

Navya Ltd has annual credit sales of Rs. 45 lakhs. Credit terms are 30 days, but its management of receivables has been poor and the average collection period is 50 days, Bad debt is 0.4 per cent of sales. A factor has offered to take over the task of debt administration and credit checking, at an annual fee of 1 per cent of credit sales. Navya Ltd. estimates that it would save Rs. 35,000 per year in administration costs as a result. Due to the efficiency of the factor, the average collection period would reduce to 30 days and bad debts would be zero. The factor would advance 80 per cent of invoiced debts at an annual interest rate of 11 per cent. Navya Ltd. is currently financing receivables from an overdraft costing 10 per cent per year.

If occurrence of credit sales is throughout the year, COMPUTE whether the factor's services should be accepted or rejected. Assume 365 days in a year.

**Ans**

| | Rs. |
|---|---|
| Present level of receivables is 45 lakh× 50/365 | 6,16,438 |
| In case of factor, receivables would reduce to 45 lakhs× 30/365 | 3,69,863 |
| The costs of the existing policyare as follows: | |
| Cost of financing existing receivables: 6,16,438×10% | 61,644 |
| Cost of bad debts: 45 lakhs × 0.4% | 18,000 |
| Cost of current policy | 79,644 |
| The cost under the factor are as follows: | |
| Cost of financing new receivable through factor: | |
| (Rs. 3,69,863 × 0.8 × 0.11) + (Rs. 3,69,863 × 0.2 × 0.10) = (32,548 + 7,397) | 39,945 |
| Factor's annual fee: 45 Lakhs × 0.01 | 45,000 |
| Administration costs saved: | (35,000) |
| Net cost under factor: | 49,945 |

From the above analysis it is clear that the factor's services are cheaper than Existing policy by Rs. 29,699 (Rs. 79,644 - Rs.49,945) per year. Hence, the services of the factor should be accepted.

**Q.2** Bank Loan, Factoring, Credit | RTP Dec 21

The Alliance Ltd., a Petrochemical sector company had just invested huge amount in its new expansion project. Due to huge capital investment, the company is in need of an additional ₹ 1,50,000 in working capital immediately. The Finance Manger has determined the following three feasible sources of working capital funds:

(i) Bank loan: The Company's bank will lend ₹ 2,00,000 at 15%. A 10% compensating balance will be required, which otherwise would not be maintained by the company.

(ii) Trade credit: The company has been offered credit terms from its major supplier of 3/30, net 90 for purchasing raw materials worth ₹ 1,00,000 per month.

(iii) Factoring: A factoring firm will buy the company's receivables of ₹ 2,00,000 per month, which have a collection period of 60 days. The factor will advance up to 75 % of the face value of the receivables at 12% on an annual basis. The factor will also charge commission of 2% on all receivables purchased. It has been estimated that the factor's services will save the company a credit department expense and bad debt expense of ₹ 1,250 and ₹ 1,750 per month respectively.

On the basis of annual percentage cost, ADVISE which alternative should the company select? Assume 360 days year.

**Ans.**

**(i) Bank loan:** Since the compensating balance would not otherwise be maintained, the real annual cost of taking bank loan would be:

$= \frac{15}{90} \times 100 = 16.67\%$ p.a.

**(ii) Trade credit:** Amount upto ₹ 1,50,000 can be raised within 2 months or 60 days. The real annual cost of trade credit would be:

$= \frac{3}{97} \times \frac{360}{60} \times 100 = 18.56\%$ p.a.

**(iii) Factoring:**

Commission charges per year = 2% x(₹ 2,00,000 x12) = ₹ 48,000
Total Savings per year = (₹ 1,250 + ₹ 1,750) x 12 = ₹ 36,000
Net factoring cost per year = ₹ 48,000 - ₹ 36,000 = ₹ 12,000

Annual Cost of Borrowing ₹ 1,50,000 receivables through factoring would be:

$= \frac{12\% \times 1,50,000 + 12,000}{1,50,000} \times 100$

$= \frac{18,000 + 12,000}{1,50,000} \times 100$

= 20% p.a.

Advise: The company should select alternative of Bank Loan as it has the lowest annual cost i.e. 16.67% p.a.

**Q.3** Bank Loan, Factoring, Credit | MTP May 23(2)

Sundaram limited a plastic manufacturing company had invested enormous amount of money in a new expansion project. Due to such a great amount of capital investment, Company needs an additional ₹ 2,00,00,000 in working capital immediately. The CFO has determined the following three feasible sources of working capital funds:
Bank Loan: The company's bank will lend ₹2,30,00,000 at 12% per annum. However, the bank will require 15% of the loan granted to be kept in a current account as the minimum average bal ance which otherwise would have been just ₹ 50,000.
Trade Credit: A major supplier with 2/20 net 80 credit terms has approached for supply of raw material worth ₹1,90,00,000 p.m.
Factoring: factoring firm will buy the companies receivables of ₹ 2,50,00,000 per month, which have a collection period of 60 days. factor will advance up to 75% of the face value of the receivables at 14 percent per annum. Factor Commission will amount to 2% on all receivables purchased. Factoring will save credit department expense and bad debts of ₹ 1,75,000 p.m. and ₹ 2,25,000 p.m.
Based on annual percentage cost, ADVISE which alternative should the company select. Assume 360 days a year

**Ans**

**(i) Bank Loan:** As the minimum average balance more than ₹ 50,000 need not be kept if loan is not undertaken, the incremental money made available by bank through bank loan is₹ 2,30,00,000- (15% x 2,30,00,000- ₹ 50,000) = ₹ 1,96,00,000. Real annual cost of bank loan = (₹ 2.3 crores x 12%) / ₹ 1.96 crores = 14.08%.

**(ii) Trade Credit**: The real annual cost of trade credit will be 2/98 x 360/60 x 100 = 12.24% .

**(iii) Factoring:**

Commission charges per year = 2% x 2.5 crores x 12 = ₹ 60,00,000
Savings per year = (1,75,000+2,25,000) x 12 = ₹ 48,00,000
Net Factoring cost per year = ₹ 60,00,000 – ₹ 48,00,000 = ₹12,00,000
Annual cost of borrowing ₹ 2.5 crores x 75% i.e. ₹ 1,87,50,000 will be
(1,87,50,000 x 14% + ₹ 12,00,000) / 1,87,50,000 = 20.4%

Conclusion: The company should select trade credit as a preferred mode of financing the working capital requirement as it results in lowest cost on an annual basis.

**Q.4** Change in Credit Terms | PY May 23

A company has current sale of ₹ 12 lakhs per year. The profit-volume ratio is 20% and post-tax cost of investment in receivables is 15%. The current credit terms are 1/10, net
50 days and average collection period is 40 days. 50% of customers in terms of sales revenue are availing cash discount and bad debt is 2% of sales.
In order to increase sales, the company want to liberalize its existing credit terms to 2/10, net 35 days. Due to which, expected sales will increase to ₹ 15 lakhs. Percentage of default in sales will remain same. Average collection period will decrease by 10 days. 80% of customers in terms of sales revenue are expected to avail cash discount under this proposed policy.
Tax rate is 30%.
ADVISE, should the company change its credit terms. (Assume 360 days in a year.)

**Ans**

(i) Calculation of Cash Discount

Cash Discount = Total credit sales × % of customers who take up discount × Rate

Present Policy = $\frac{12,00,000 \times 50 \times 0.01}{100}$ = ₹ 6,000

Proposed Policy = 15,00,000 × 0.80 × 0.02 = ₹ 24,000

(ii) Opportunity Cost of Investment in Receivables

Present Policy: Opportunity Cost = Total Cost × $\frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$

= 9,60,000 × $\frac{40}{360} \times \frac{15}{100}$ = ₹ 16,000

Proposed Policy: = Total Cost × $\frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$

= 12,00,000 × $\frac{30}{360} \times \frac{15}{100}$ = ₹ 15,000

Statement showing Evaluation of Credit Policies

| Particulars | Present Policy | Proposed Policy |
|---|---|---|
| Credit Sales | 12,00,000 | 15,00,000 |
| Variable Cost @ 80%* of sales | 9,60,000 | 12,00,000 |
| Bad Debts @ 2% | 24,000 | 30,000 |
| Cash Discount | 6,000 | 24,000 |
| Profit before tax | 2,10,000 | 2,46,000 |
| Tax @ 30% | 63,000 | 73,800 |
| Profit after Tax | 1,47,000 | 1,72,200 |
| Opportunity Cost of Investment in Receivables | 16,000 | 15,000 |
| Net Profit | 1,31,000 | 1,57,200 |

*Only relevant or variable costs are considered for calculating the opportunity costs on the funds blocked in receivables. Since 20% is profit-volume ratio, hence the relevant costs are taken to be 80% of the respective sales.

Advise: Proposed policy should be adopted since the net benefit is increased by
(₹ 1,57,200 - ₹ 1,31,000) = ₹ 26,200.

**Alternative presentation using incremental approach**

| | | ₹ |
|---|---|---|
| Incremental sales (15,00,000 – 12,00,000) | | 3,00,000 |
| Less: Incremental variable cost (12,00,000 – 9,60,000) | | 2,40,000 |
| Less: Incremental Bad debts (30,000 – 24,000) | | 6,000 |
| Less: Incremental Cash discount (24,000 – 6,000) | | 18,000 |
| Increase in Profit Before Tax | | 36,000 |
| Less: Tax @ 30% | | 10,800 |
| Increase in Profit After Tax | 25,200 | |
| Add: Savings in opportunity cost (16,000 - 15,000) | | 1,000 |
| Increase in Net Profit | 26,200 | |

**Advise:** Proposed policy should be adopted since the net benefit is increased by (₹ 1,57,200 - ₹ 1,31,000) = ₹ 26,200.

**Q.5** Collection Expenses | PY Jul 21

Current annual sale of SKD Ltd. is ₹ 360 lakhs. It's directors are of the opinion that company's current expenditure on receivables management is too high and with a view to reduce the expenditure they are considering following two new alternate credit policies:

| | Policy X | Policy Y Average |
|---|---|---|
| collection period | 1.5 months | 1 month |
| % of default | 2% | 1% |
| Annual collection expenditure | ₹ 12 lakh | ₹ 20 lakh |

Selling price per unit of product is ₹ 150. Total cost per unit is ₹ 120. Current credit terms are 2 months and percentage of default is 3%.

Current annual collection expenditure is ₹ 8 lakh. Required rate of return on investment of SKD Ltd. is 20%. Determine which credit policy SKD Ltd. should follow.

**Ans** **Statement showing the Evaluation of Credit policies (Total Approach)**

| Particulars | | Present Policy (2 Months) | Proposed Policy X(1.5 Months) | Proposed Policy Y (1 Month) |
|---|---|---|---|---|
| | | ₹ in lakhs | ₹ in lakhs | ₹ in lakhs |
| A. | | | | Expected Profit: |
| | (a) Credit Sales* | 360 | 360 | 360 |
| | (b) Total Cost other than Bad Debts and collection expenditure (360/150 x 120) | 288 | 288 | 288 |
| | (c) Bad Debts | 10.8 | 7.2 | 3.6 |
| | | (360 x 0.03) | (360 x 0.02) | (360 x 0.01) |

| | | | | |
|---|---|---|---|---|
| | (d) Collection expenditure | 8 | 12 | 20 |
| | (e) Expected Profit [(a) – (b) – (c) - (d)] | 53.2 | 52.8 | 48.4 |
| B. | Opportunity Cost of Investments in Receivables (Working Note) | 9.6 | 7.2 | 4.8 |
| C. | Net Benefits (A – B) | 43.6 | 45.6 | 43.6 |

Recommendation: The Proposed Policy X should be followed since the net benefits under this policy are higher as compared to other policies.
*Note: It is assumed that all sales are on credit.
Working Note:
Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{12} \times \frac{\text{Rate of Re turn}}{100}$$

Present Policy = ₹ 288 lakhs × $\frac{2}{12} \times \frac{20}{100}$ = ₹ 9.6 lakhs

Policy X = ₹ 288 lakhs × $\frac{1.5}{12} \times \frac{20}{12}$ = ₹ 7.2 lakhs

Policy X = ₹ 288 lakhs × $\frac{1}{12} \times \frac{20}{100}$ = ₹ 4.8 lakhs

**Alternatively**
Statement showing the Evaluation of Credit policies (Incremental Approach)

| Particulars | | Present Policy (2 Months) | Proposed Policy X (1.5 Months) | Proposed Policy Y (1 Month) |
|---|---|---|---|---|
| | | ₹ in lakhs | ₹ in lakhs | ₹ in lakhs |
| | (a) Credit Sales* | 360 | 360 | 360 |
| | (b) Cost of sales (360/150 x 120) | 288 | 288 | 288 |
| | (c) Receivables (Refer Working Note) | 48 | 36 | 24 |
| | (d) Reduction in receivables from present policy | - | 12 | 24 |
| (A) | Savings in Opportunity Cost of Investment in Receivables (@ 20%) | - | 2.4 | 4.8 |
| | (e) Bad Debts | 10.8 | 7.2 | 3.6 |
| | | (360 x 0.03) | (360 x 0.02) | (360 x 0.01) |
| (B) | Reduction in bad debts from present policy | - | 3.6 | 7.2 |
| | (f) Collection expenditure | 8 | 12 | 20 |
| (C) | Increase in Collection expenditure from Present policy | - | 4 | 12 |
| (D) | Net Benefits (A +B-C) | | 2 | 0 |

Recommendation: The Proposed Policy X should be followed since the net benefits under this policy are higher as compared to other policies.
*Note: It is assumed that all sales are on credit.
**Working Note:**

$$\text{Calculation of Investment in Receivables} = \text{Total Cost} \times \frac{\text{Collection period}}{12}$$

Present Policy = ₹ 288 lakhs × $\frac{2}{12}$ = ₹ 48 lakhs

Policy X = ₹ 288 lakhs × $\frac{1.5}{12}$ = ₹ 36 lakhs

Policy Y = ₹ 288 lakhs × $\frac{1}{12}$ = ₹ 24 lakhs

**Q.6** Credit policy | PY Nov 18

MN Ltd. has a current turnover of ₹ 30,00,000 p.a. Cost of Sale is 80% of turnover and Bad Debts are 2% of turnover, Cost of Sales includes 70% variable cost and 30% Fixed Cost, while company's required rate of return is 15%. MN Ltd. currently allows 15 days credit to its customer, but it is considering increase this to 45 days credit in order to increase turnover.

It has been estimated that this change in policy will increase turnover by 20%, while Bad Debts will increase by 1%. It is not expected that the policy change will result in an increase in fixed cost and creditors and stock will be unchanged.

Should MN Ltd. introduce the proposed policy? (Assume 360 days year)

**Ans**

**Statement Showing Evaluation of Credit Policies**

| | Particulars | Present Policy | Proposed Policy |
|---|---|---|---|
| A. | Expected Contribution | | |
| | (a) Credit Sales | 30,00,000 | 36,00,000 |
| | (b) *Less:* Variable Cost | 16,80,000 | 20,16,000 |
| | (c) Contribution | 13,20,000 | 15,84,000 |
| | (d) *Less:* Bad Debts | 60,000 | 1,08,000 |
| | (e) Contribution after Bad debt [(c)-(d)] | 12,60,000 | 14,76,000 |
| B. | Opportunity Cost of investment in Receivables | 15,000 | 54,000 |
| C. | Net Benefits [A-B] | 12,45,000 | 14,22,000 |
| D. | Increase in Benefit | | 1,77,000 |

Recommendation: Proposed Policy i.e credit from 15 days to 45 days should be implemented by NM Ltd since the net benefit under this policy are higher than those under present policy

1 Working Note:

| | Present Policy (₹) | Propose Policy (₹) |
|---|---|---|
| Sales | 30,00,000 | 36,00,000 |
| Cost of Sales (80% of sales) | 24,00,000 | 28,80,000 |
| Variable cost (70% of cost of sales) | 16,80,000 | 20,16,000 |

2. Opportunity Costs of Average Investments

$$\text{Variable Cost} \times \frac{\text{Collection period}}{\text{Return}} \times \text{Rate of}$$

Present Policy =₹ 24,00,000 × $\frac{45}{360}$ x15% ₹ 54,000

Proposed Policy = $\frac{15}{360}$ =15% ₹ 18,000

**Q.7** Credit Policy | RTP May 23

River limited currently uses the credit terms of 1.5/15 net 45 days and average collection period was 30 days. The company presently having sales of ₹ 50,00,000 and 30% customers availing the discount. The chances of default are currently 5%. Variable cost constitutes 65% and total cost constitute 85% of sales. The company is planning liberalization of credit terms to 2/20 net 50 days. It is expected that sales are likely to increase by ₹ 5,00,000, the default chances are 10% and average collection period will decline to 25 days. There won't be any change in the fixed cost and 50% customers are expected to avail the discount. Tax rate is 35%. EVALUATE this policy in comparison with the current policy and recommend whether the new policy should be implemented. Assume cost of capital to be 10% (post tax) and 360 days in a year.

**Ans**

**Evaluation of Credit Policies**

| | Particulars | 1.5/15 net 45 | 2/20 net 50 |
|---|---|---|---|
| A | Sales | ₹50,00,000 | ₹55,00,000 |
| B | Variable Cost (65%) | ₹32,50,000 | ₹35,75,000 |
| C | Fixed Cost (20% in 1st Case) | ₹10,00,000 | ₹10,00,000 |
| D | Bad Debts (5% and 10%) | ₹2,50,000 | ₹5,50,000 |
| E | Discounts | | |
| | (₹5000000x30%x1.5%) | ₹22,500 | - |
| | (₹5500000x50%x2%) | - | ₹55,000 |
| F | PBT (A-B-C-D-E) | ₹4,77,500 | ₹3,20,000 |
| G | Tax @ 35% | ₹1,67,125 | ₹1,12,000 |
| H | PAT | ₹3,10,375 | ₹2,08,000 |
| I | Opportunity Cost | | |
| | (₹3250000 + ₹1000000) x 30/360x10% | ₹35,417 | - |
| | (₹3575000 + ₹1000000) x 25/360 x 10% | - | ₹31,771 |
| J | Net Benefit | ₹2,74,958 | ₹1,76,229 |

The new policy leads to lower net benefit for the company. Hence it should not be implemented.

**Q.8** Credit Policy | RTP Nov 20

A company wants to follow a more prudent policy to improve its sales for the region which is ₹ 9 lakhs per annum at present, having an average collection period of 45 days. After certain researches, the management consultant of the company reveals the following information:

| Credit Policy | Increase in collection period | Increase in sales | Present default anticipated |
|---|---|---|---|
| W | 15 days | ₹ 60,000 | 1.5% |
| X | 30 days | ₹ 90,000 | 2% |
| Y | 45 days | ₹ 1,50,000 | 3% |
| Z | 70 days | ₹ 2,10,000 | 4% |

The selling price per unit is ₹ 3. Average cost per unit is ₹ 2.25 and variable costs per unit are ₹ 2. The current bad debt loss is 1%. Required return on additional investment is 20%. (Assume 360 days year)

ANALYSE which of the above policies would you recommend for adoption?

**Ans** **A. Statement showing the Evaluation of Debtors Policies (Total Approach)**

**(Amount in ₹)**

| Particulars | | Present Policy 45 days | Proposed Policy W | Proposed Policy X | Proposed Policy Y | Proposed Policy Z 115 days |
|---|---|---|---|---|---|---|
| I. | Expected Profit: | | | | | |
| | (a) Credit Sales | 9,00,000 | 9,60,000 | 9,90,000 | 10,50,000 | 11,10,000 |
| | (b) Total Cost other than Bad Debts | | | | | |
| | (i) Variable Costs [Sales × 2/ 3] | 6,00,000 | 6,40,000 | 6,60,000 | 7,00,000 | 7,40,000 |
| | (ii) Fixed Costs | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 |
| | | 6,75,000 | 7,15,000 | 7,35,000 | 7,75,000 | 8,15,000 |
| | (c) Bad Debts | 9,000 | 14,400 | 19,800 | 31,500 | 44,400 |
| | (d) Expected Profit [(a) – (b) – (c)] | 2,16,000 | 2,30,600 | 2,35,200 | 2,43,500 | 2,50,600 |
| II. | Opportunity Cost of Investments in Receivables | 16,875 | 23,833 | 30,625 | 38,750 | 52,069 |
| III. | Net Benefits (I – II) | 1,99,125 | 2,06,767 | 2,04,575 | 2,04,750 | 1,98,531 |

Recommendation: The Proposed Policy W (i.e. increase in collection period by 15 days or total 60 days) should be adopted since the net benefits under this policy are higher as compared to other policies.

Working Notes:

(i) Calculation of Fixed Cost = [Average Cost per unit – Variable Cost per unit] × No. of Units sold

= [₹ 2.25 - ₹ 2.00] × (₹ 9,00,000/3)

= ₹ 0.25 × 3,00,000 = ₹ 75,000

(ii) Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

Present Policy = $6,75,000 \times \frac{45}{360} \times \frac{20}{100}$ = 16,875

Policy W = $7,15,000 \times \frac{60}{360} \times \frac{20}{100}$ = 23,833

Policy X = $7,35,000 \times \frac{75}{360} \times \frac{20}{100}$ = 30,625

Policy Y = $7,75,000 \times \frac{90}{360} \times \frac{20}{100}$ = 38,750

Policy Z = $8,15,000 \times \frac{115}{360} \times \frac{20}{100}$ = 52,069

**B. Another method of solving the problem is Incremental Approach. Here we assume that sales are all credit sales.**

(Amount in ₹)

| Particulars | | Present Policy 45 days | Proposed Policy W 60 days | Proposed Policy X 75 days | Proposed Policy Y 90 days | Proposed Policy Z 115 days |
|---|---|---|---|---|---|---|
| I. | Incremental Expected Profit: | | | | | |
| | (a) Incremental Credit Sales | 0 | 60,000 | 90,000 | 1,50,000 | 2,10,000 |
| | (b) Incremental Costs | | | | | |
| | (i) Variable Costs | 6,00,000 | 40,000 | 60,000 | 1,00,000 | 1,40,000 |
| | (ii) Fixed Costs | 75,000 | - | - | - | - |
| | (c) Incremental Bad Debt | 9,000 | 5,400 | 10,800 | 22,500 | 35,400 |
| | (d) Incremental Expected Profit (a – b –c)] | | 14,600 | 19,200 | 27,500 | 34,600 |
| II. | Required Return on Incremental Investments: | | | | | |
| | (a) Cost of Credit Sales | 6,75,000 | 7,15,000 | 7,35,000 | 7,75,000 | 8,15,000 |
| | (b) Collection period | 45 | 60 | 75 | 90 | 115 |
| | (c) Investment in Receivable (a × b/360) | 84,375 | 1,19,167 | 1,53,125 | 1,93,750 | 2,60,347 |
| | (d) Incremental Investment in Receivables | - | 34,792 | 68,750 | 1,09,375 | 1,75,972 |
| | (e) Required Rate of Return (in %) | | 20 | 20 | 20 | 20 |
| | (f) Required Return on Incremental Investments | - | 6,958 | 13,750 | 21,875 | 35,194 |
| III. | Net Benefits (I – II) | - | 7,642 | 5,450 | 5,625 | (594) |

Recommendation: The Proposed Policy W should be adopted since the net benefits under this policy are higher than those under other policies.

**C. Another method of solving the problem is by computing the Expected Rate of Return**

$$\text{Expected Rate of Return} = \frac{\text{Incremental Expected Profit}}{\text{Incremental Investmentin Receivables}} \times 100$$

$$\text{For Policy W} = \frac{14,500}{34,792} \times 100 = 41.96\%$$

$$\text{For Policy X} = \frac{19,200}{68,750} \times 100 = 27.93\%$$

$$\text{For Policy Y} = \frac{27,500}{109,375} \times 100 = 25.14\%$$

For Policy Z $= \frac{34,600}{1,75,972} \times 100 = 19.66\%$

Recommendation: The Proposed Policy W should be adopted since the Expected Rate of Return (41.96%) is more than the Required Rate of Return (20%) and is highest among the given policies compared.

**Q.9** Credit Policy | RTP May 20

TM Limited, a manufacturer of colour TV sets is considering the liberalization of existing credit terms to three of their large customers A, B and C. The credit period and likely quantity of TV sets that will be sold to the customers in addition to other sales are as follows:

Quantity sold (No. of TV Sets)

| Credit Period (Days) | A | B | C |
|---|---|---|---|
| 0 | 10,000 | 10,000 | - |
| 30 | 10,000 | 15,000 | - |
| 60 | 10,000 | 20,000 | 10,000 |
| 90 | 10,000 | 25,000 | 15,000 |

The selling price per TV set is ₹15,000. The expected contribution is 50% of the selling price. The cost of carrying receivable averages 20% per annum.

You are required to COMPUTE the credit period to be allowed to each customer. (Assume 360 days in a year for calculation purposes).

**Ans**

In case of customer A, there is no increase in sales even if the credit is given. Hence comparative statement for B & C is given below:

| Particulars | Customer B | | | | Customer C | | | |
|---|---|---|---|---|---|---|---|---|
| 1. Credit period (days) | 0 | 30 | 60 | 90 | 0 | 30 | 60 | 90 |
| 2. Sales Units | 10,000 | 15,000 | 20,000 | 25,000 | - | - | 10,000 | 15,000 |
| | ₹ in lakh | | | | ₹in lakh | | | |
| 3. Sales Value | 1,500 | 2,250 | 3,000 | 3,750 | - | - | 1,500 | 2,250 |
| 4. Contribution at 50% (A) | 750 | 1,125 | 1,500 | 1,875 | - | - | 750 | 1,125 |
| 5. Receivables:- Credit Period × Sale 360 | - | 187.5 | 500 | 937.5 | - | - | 250 | 562.5 |
| 6. Debtors at cost | - | 93.75 | 250 | 468.75 | - | - | 125 | 281.25 |
| 7. Cost of carrying debtors at 20% (B) | - | 18.75 | 50 | 93.75 | - | - | 25 | 56.25 |
| 8. Excess of contributions over cost of carrying debtors (A – B) | 750 | 1,106.25 | 1,406.25 | 1,781.25 | - | - | 725 | 1,068.75 |

The excess of contribution over cost of carrying Debtors is highest in case of credit period of 90 days in respect of both the customers B and C. Hence, credit period of 90 days should be allowed to B and C.

**Q.10** Credit Policy | RTP Nov 19

A regular customer of your company has approached to you for extension of credit facility for purchasing of goods. On analysis of past performance and on the basis of information supplied, the following pattern of payment schedule emerges:

| Pattern of Payment Schedule | |
|---|---|
| At the end of 30 days | 20% of the bill |
| At the end of 60 days | 30% of the bill. |

| | |
|---|---|
| At the end of 90 days | 30% of the bill. |
| At the end of 100 days | 18% of the bill. |
| Non-recovery | 2% of the bill. |

The customer wants to enter into a firm commitment for purchase of goods of ₹30 lakhs in 2019, deliveries to be made in equal quantities on the first day of each quarter in the calendar year. The price per unit of commodity is ₹300 on which a profit of ₹10 per unit is expected to be made. It is anticipated that taking up of this contract would mean an extra recurring expenditure of ₹10,000 per annum. If the opportunity cost is 18% per annum, would you as the finance manager of the companyRECOMMEND the grant of credit to the customer? Assume 1 year = 360 days.

**Ans**

**Statement showing the Evaluation of credit Policies**

| Particulars | Proposed Policy₹ |
|---|---|
| A. Expected Profit: | |
| (a) Credit Sales | 30,00,000 |
| (b) Total Cost | |
| (i) Variable Costs | 29,00,000 |
| (ii) Recurring Costs | 10,000 |
| | 29,10,000 |
| (c) Ba d Debts | 60,000 |
| (d) Expected Profit [(a) – (b) – (c)] | 30,000 |
| B. Opportunity Cost of Investments in Receivables | 1,00,395 |
| C. Net Benefits (A – B) | (70,395) |

Recommendation: The Proposed Policy should not be adopted since the net benefits under this policyare negative

Working Note: Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection Period}}{360} \times \frac{\text{Rate of Return}}{100}$$

| Particulars | 20% | 30% | 30% | 18% | Total |
|---|---|---|---|---|---|
| A. Total Cost | 5,82,000 | 8,73,000 | 8,73,000 | 5,23,800 | 28,51,800 |
| B. Collection period | 30/360 | 60/360 | 90/360 | 100/360 | |
| C. Required Rate of Return | 18% | 18% | 18% | 18% | |
| D. Opportunity Cost (A × B × C) | 8,730 | 26,190 | 39,285 | 26,190 | 1,00,395 |

**Q.11** Credit Policy | RTP Nov 18

Tony Limited, manufacturer of Colour TV sets is considering the liberalization of existing credit terms to three of their large customers A, B and C. The credit period and likely quantity of TV sets that will be sold to the customers in addition to other sales are as follows:

Quantity sold (No. of TV Sets)

| Credit Period (Days) | A | B | C |
|---|---|---|---|
| 0 | 1,000 | 1,000 | - |
| 30 | 1,000 | 1,500 | - |
| 60 | 1,000 | 2,000 | 1,000 |
| 90 | 1,000 | 2,500 | 1,500 |

The selling price per TV set is ₹ 9,000. The expected contribution is 20% of the selling price. The cost of carrying receivable averages 20% per annum.

You are required:

(a) COMPUTE the credit period to be allowed to each customer.

(Assume 360 days in a year for calculation purposes).

(b) DEMONSTRATE the other problems the company might face in allowing the credit period as determined in (a) above?

**Ans**

**(a) In case of customer A, there is no increase in sales even if the credit is given. Hence comparative statement for B & C is given below:**

| Particulars | Customer B | | | | Customer C | | | |
|---|---|---|---|---|---|---|---|---|
| 1. Credit period (days) | 0 | 30 | 60 | 90 | 0 | 30 | 60 | 90 |
| 2. Sales Units | 1,000 | 1,500 | 2,000 | 2,500 | - | - | 1,000 | 1,500 |
| | ₹ in lakhs | | | | ₹in lakhs | | | |
| 3. Sales Value | 90 | 135 | 180 | 225 | - | - | 90 | 135 |
| 4. Contribution at 20% (A) | 18 | 27 | 36 | 45 | - | - | 18 | 27 |
| 5. Receivables: Credit Period × Sales / 360 | - | 11.25 | 30 | 56.25 | - | - | 15 | 33.75 |
| 6. Debtors at cost i.e. 80% of 11.25 | - | 9 | 24 | 45 | - | - | 12 | 27 |
| 7. Cost of carrying debtors at 20% (B) | - | 1.8 | 4.8 | 9 | - | - | 2.4 | 5.4 |
| 8. Excess of contributions over cost of carrying debtors (A – B) | 18 | 25.2 | 31.2 | 36 | - | - | 15.6 | 21.6 |

The excess of contribution over cost of carrying Debtors is highest in case of credit period of 90 days in respect of both the customers B and C. Hence, credit period of90 days should be allowed to B and C.

**(b) Problem:**

(i) Customer A is taking 1000 TV sets whether credit is given or not. Customer C is taking 1000 TV sets at credit for 60 days. Hence A also may demand credit for 60 days compulsorily.

(ii) B will take 2500 TV sets at credit for 90 days whereas C would lift 1500 sets only. In such case B will demand further relaxation in credit period i.e. B may ask for 120 days credit.

**Q.12** Credit Policy | MTP Nov 22(2)

Avesh Pvt. Ltd. is considering relaxing its present credit policy for accounts receivable and is in the process of evaluating two proposed policies. Currently, the company has annual credit sales of ₹ 55 lakhs and accounts receivable turnover ratio of 5 times a year. The current level of loss due to bad debts is ₹ 2,00,000. The company is required to give a return of 15% on the investment in new accounts receivable. The company's variable costs are 75% of the selling price. Given the following information, IDENTIFY which is the better policy?

**(Amount in ₹)**

| Particulars | Present Policy | Proposed Policy 1 | Proposed Policy 2 |
|---|---|---|---|
| Annual credit sales | 55,00,000 | 65,00,000 | 70,00,000 |
| Accounts receivable turnover ratio | 5 times | 4 times | 3 times |
| Bad debt losses | 2,00,000 | 3,50,000 | 5,00,000 |

**Ans**

**Statement showing the Evaluation of Accounts Receivable Policies**

**(Amount in ₹)**

| A | Particulars | Present Policy | Proposed Policy 1 | Proposed Policy 2 |
|---|---|---|---|---|
| | Expected Profit: | | | |
| | (a) Credit Sales | 55,00,000 | 65,00,000 | 70,00,000 |
| | (b) Total Cost other than Bad Debts: | | | |

| | | | | |
|---|---|---|---|---|
| | (i) Variable Costs (75%) | 41,25,000 | 48,75,000 | 52,50,000 |
| | (c) Bad Debts | 2,00,000 | 3,50,000 | 5,00,000 |
| | (d) Expected Profit [(a) – (b) – (c)] | 11,75,000 | 12,75,000 | 12,50,000 |
| B | Opportunity Cost of Investments in Accounts Receivable (Working Note) | 1,23,750 | 1,82,813 | 2,62,500 |
| C | Net Benefits (A – B) | 10,51,250 | 10,92,187 | 9,87,500 |

Recommendation: The Proposed Policy 1 should be adopted since the net benefits under this policy are higher as compared to other policies.

**Working Note:**

Calculation of Opportunity Cost of Average Investments

Opportunity Cost = Total Cost × Collection period/12 × Rate of Return/100

Present Policy = ₹ 41,25,000 × 2.4/12 × 15% = ₹1,23,750

Proposed Policy 1 = ₹ 48,75,000× 3/12 × 15% = ₹ 1,82,813

Proposed Policy 2 = ₹ 52,50,000× 4/12 × 15% = ₹ 2,62,500

**Q.13** Credit Policy | MTP Nov 22(1)

GT Ltd. is taking into account the revision of its credit policy with a view to increasing its sales and profit. Currently, all its sales are on one month credit. Other information is as follows:

Contribution 2/5th of Sales Revenue

Additional funds raising cost 20% per annum

The marketing manager of the company has given the following options along with estimates for considerations:

| Particulars | Current Position | Option I | Option II | Option III |
|---|---|---|---|---|
| Sales Revenue (₹) | 40,00,000 | 42,00,000 | 44,00,000 | 50,00,000 |
| Credit period (in months) | 1 | $1\frac{1}{2}$ | 2 | 3 |
| Bad debts (% of sales) | 2 | $2\frac{1}{2}$ | 3 | 5 |
| Cost of Credit administration (₹) | 24,000 | 26,000 | 30,000 | 60,000 |

You are required to ADVISE the company for the best option.

**Ans**

**Statement Showing Evaluation of Credit Policies**

**(₹ in lakhs)**

| Particulars | Current position (1 month) | Option I (1.5 months) | Option II (2 months) | Option III (3 months) |
|---|---|---|---|---|
| Sales Revenue | 40,00,000 | 42,00,000 | 44,00,000 | 50,00,000 |
| Contribution @ 40% | 16,00,000 | 16,80,000 | 17,60,000 | 20,00,000 |
| Increase in contribution over Current level price (A) | - | 80,000 | 1,60,000 | 4,00,000 |
| Debtors = $\frac{\text{Average Collection period} \times \text{Credit Sale}}{12}$ | - | $\frac{1 \times 40,00,000}{12}$ = 3,33,333.33 | $\frac{1.5 \times 42,00,000}{12}$ = 5,25,000 | $\frac{3 \times 50,00,000}{12}$ = 12,50,000 |
| Increase in debtors over current level | | 1,91,666.67 | 4,00,000.00 | 9,16,666.67 |
| Cost of funds for additional amount of debtos @ 20% (B) | – | 38,333.33 | 80,000.00 | 1,83,333.33 |

| | | | | |
|---|---|---|---|---|
| Credit administrative cost | 24,000 | 26,000 | 30,000 | 60,000 |
| Increase in credit administration cost over present level (c) | - | 2,000 | 6,000 | 36,000 |
| Bad debts | 80,000 | 1,05,000 | 1,32,000 | 2,50,000 |
| Increase in bad debts over current levels (D) | - | 25,000 | 52,000 | 1,70,000 |
| Net gain/loss A – (B + C + D) | - | 14,666.67 | 22,000.00 | 10,666.67 |

Advise: It is suggested that the company GT Ltd. should implement Option II with a net gain of₹ 22,000 which has a credit period of 2 months

**Q.14** Credit Policy | MTP May 21(2)

WQ Limited is considering relaxing its present credit policy and is in the process of evaluating two proposed polices. Currently, the firm has annual credit sales of Rs . 180 lakh and Debtors turnover ratio of 4 times a year. The current level of loss due to bad debts is Rs. 6 lakh. The firm is required to give a return of 25% on the investment in new accounts receivables. The company's variable costs are 60% of the selling price. Given the following information, DETERMINE which is a better Policy?

**(Amount in lakhs)**

| | Present Policy | Proposed Policy | |
|---|---|---|---|
| | | Option I | Option II |
| Annual credit sales (Rs.) | 180 | 220 | 280 |
| Debtors turnover ratio | 4 | 3.2 | 2.4 |
| Bad debt losses (Rs.) | 6 | 18 | 38 |

**Ans** Statement showing evaluation of Credit Policies

**(Amount in lakhs)**

| | Particulars | Present (Rs.) | Proposed Policy (Rs.) | |
|---|---|---|---|---|
| | | | Option I | Option II |
| A | Expected Profit: | | | |
| | (a) Credit Sales | 180 | 220 | 280 |
| | (b) Total Cost other than Bad Debts: | | | |
| | Variable Costs (60%) | 108 | 132 | 168 |
| | (c) Bad Debts | 6 | 18 | 38 |
| | (d) Expected Profit [(a)-(b)-(c)] | 66 | 70 | 74 |
| B | Opportunity Cost of Investment in Debtors (Refer workings) | 6.75 | 10.31 | 17.5 |
| C | Net Benefits [A - B] | 59.25 | 59.69 | 56.5 |

Recommendation: The Proposed Policy I should be adopted since the net benefits under this policy is higher than those under other policies.

Workings:

Calculation of Opportunity Cost of Investment in Debtors

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection Period}}{12} \times \frac{\text{Rate of Return}}{100}$$

*Collection period (in months) = 12/Debtors turnover ratio

$$\text{Present Policy} = \text{Rs. } 108 \times \frac{12/4}{12} \times \frac{25}{100} = \text{Rs. } 6.75 \text{ lakhs}$$

Proposed Policy I = Rs. 132 × $\frac{12/3.2}{12} \times \frac{25}{100}$ = Rs. 10.31 lakhs

Proposed Policy II = Rs. 168 × $\frac{12/2.4}{12} \times \frac{25}{100}$ = Rs. 17.5 lakhs

**Q.15** Credit Policy | MTP Nov 18(1)

RST Limited is considering relaxing its present credit policy and is in the process of evaluating two proposed polices. Currently, the firm has annual credit sales of Rs 225 lakhs and accounts receivable turnover ratio of 5 times a year. The current level of loss due to bad debts is Rs.7,50,000. The firm is required to give a return of 20% on the investment in new accounts receivables. The company's variable costs are 60% of the selling price. Given the following information, DETERMINE which is a better option?

**(Amount in lakhs)**

| | Present Policy | Policy Option I | Policy Option II |
|---|---|---|---|
| Annual credit sales (Rs) | 225 | 275 | 350 |
| Accounts receivable turnover ratio | 5 | 4 | 3 |
| Bad debt losses (Rs) | 7.5 | 22.5 | 47.5 |

**Ans**

**Statement showing Evaluation of Credit Policies** **(Amount in lakhs)**

| | Particulars | Present Policy (Rs.) | Proposed Policy I (Rs.) | Proposed Policy II(Rs.) |
|---|---|---|---|---|
| A | Expected Profit : | | | |
| | (a) Credit Sales | 225.00 | 275.00 | 350.00 |
| | (b) Total Cost other than Bad Debts: | | | |
| | Variable Costs | 135.00 | 165.00 | 210.00 |
| | (c) Bad Debts | 7.50 | 22.50 | 47.50 |
| | (d) Expected Profit [(a)-(b)-(c)] | 82.50 | 87.50 | 92.50 |
| B | Opportunity Cost of Investment in Receivables* | 5.40 | 8.25 | 14.00 |
| C | Net Benefits [A-B] | 77.10 | 79.25 | 78.50 |

Recommendation: The Proposed Policy I should be adopted since the net benefits under this policy is higher than those under other policies.

Working Note:

*Calculation of Opportunity Cost of Average Investments

Opportunity Cost = Total Cost × $\frac{\text{Collection Period}}{12} \times \frac{\text{Rate of Return}}{100}$

Present Policy = Rs.135 lakhs × 2.4/12 × 20% = Rs. 5.40 lakhs

Proposed Policy I = Rs.135 lakhs × 2.4/12 × 20% = Rs. 5.40 lakhs

Proposed Policy II =Rs. 210 lakhs × 4/12 × 20% = Rs. 14.00 lakhs

**Q.16** Factoring | PY Dec 21

A factoring firm has offered a company to buy its accounts receivables.

The relevant information is given below:

(i) The current average collection period for the company's debt is 80 days and ½% of debtors default. The factor has agreed to pay over money due to the company after60 days and it will suffer all the losses of bad debts also.

(ii) Factor will charge commission @2%.

(iii) The company spends ₹ 1,00,000 p.a. on administration of debtor.These are avoidable cost.

(iv) Annual credit sales are ₹ 90 lakhs. Total variable costs is 80% of sales. The company's cost of borrowing is 15% per annum. Assume 365 days in a year.

Should the company enter into agreement with factoring firm?

**Ans**

| | Particulars | (₹) |
|---|---|---|
| A. | Annual Savings (Benefit) on taking Factoring Service | |
| | Cost of credit administration saved | |
| | Bad debts avoided (₹ 90 lakh x ½%) | 1,00,000 |
| | Interest saved due to reduction in average collection period [₹ 90 lakh x 0.80 × 0.15 × (80 days – 60 days)/365 days] | 45,000<br>59,178 |
| | Total | 2,04,178 |
| B. | Annual Cost of Factoring to the Firm: | |
| | Factoring Commission [₹ 90 lakh × 2%] | 1,80,000 |
| | Total | 1,80,000 |
| C. | Net Annual Benefit of Factoring to the Firm (A – B) | 24,178 |

Advice: Since savings to the firm exceeds the cost to the firm on account of factoring, therefore, the company should enter into agreement with the factoring firm.

**Q.17** Grant of Credit of Not | RTP Nov 23

A regular customer of your company has approached to you for extension of credit facility for purchasing of goods. On analysis of past performance and on the basis of information supplied, the following pattern of payment schedule emerges:

| Pattern of Payment Schedule At | |
|---|---|
| the end of 30 days | 20% of the bill At |
| the end of 60 days | 30% of the bill |
| At the end of 90 days | 30% of the bill |
| At the end of 100 days | 18% of the bill |
| Non-recovery | 2% of the bill |

The customer wants to enter into a firm commitment for purchase of goods of ₹ 40 lakhs in 2022, deliveries to be made in equal quantities on the first day of each quarter in the calendar year. The price per unit of commodity is ₹ 400 on which a profit of ₹ 20 per unit is expected to be made. It is anticipated that taking up of this contract would mean an extra recurring expenditure of ₹ 20,000 per annum. If the opportunity cost is 18% per annum, would you as the finance manager of the company RECOMMEND the grant of credit to the customer? Assume 1 year = 360 days.

**Ans**

**Statement showing the Evaluation of credit Policies**

| Particulars | Proposed Policy ₹ |
|---|---|
| A. Expected Profit: | |
| (a) Credit Sales | 40,00,000 |
| (b) Total Cost | |
| (i) Variable Costs (₹ 380 x 10000 units) | 38,00,000 |
| (ii) Recurring Costs | 20,000 |
| | 38,20,000 |
| (c) Bad Debts | 80,000 |
| (d) Expected Profit [(a) – (b) – (c)] | 1,00,000 |
| B. Opportunity Cost of Investments in Receivables | 1,31,790 |
| C. Net Benefits (A – B) | (31,790) |

Recommendation: The Proposed Policy should not be adopted since the net benefits under this policy are negative.

Working Note: Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection Period}}{360} \times \frac{\text{Rate of Return}}{100}$$

| Particulars | 20% | 30% | 30% | 18% | Total |
|---|---|---|---|---|---|
| A. Total Cost | 7,64,000 | 11,46,000 | 11,46,000 | 6,87,600 | 37,43,600 |
| B. Collection period | 30/360 | 60/360 | 90/360 | 100/360 | |
| C. Required Rate of Return | 18% | 18% | 18% | 18% | |
| D. Opportunity Cost (A × B × C) | 11,460 | 34,380 | 51,570 | 34,380 | 1,31,790 |

**Q.18** Payment to Debtor | MTP May 19(1)

A bank is analysing the receivables of J Ltd. in order to identify acceptable collateral for a short-term loan. The company's credit policy is 2/10 net 30. The bank lends 80 percent on accounts where customers are not currently overdue and where the average payment period does not exceed 10 days past the net period. A schedule of J Ltd.'s receivables has been prepared. ANALYSE, how much will the bank lend on pledge of receivables, if the bank uses a 10 per cent allowance for cash discount and returns?

| Account | Amount Rs. | Days Outstanding in days | Average Payment Period historically |
|---|---|---|---|
| 74 | 25,000 | 15 | 20 |
| 91 | 9,000 | 45 | 60 |
| 107 | 11,500 | 22 | 24 |
| 108 | 2,300 | 9 | 10 |
| 114 | 18,000 | 50 | 45 |
| 116 | 29,000 | 16 | 10 |
| 123 | 14,000 | 27 | 48 |
| | 1,08,800 | | |

**Ans**

Analysis of the receivables of J Ltd. by the bank in order to identify acceptable collateral for a short- term loan:

(i) The J Ltd.'s credit policy is 2/10 net 30.
The bank lends 80 per cent on accounts where customers are not currently overdue and where the average payment period does not exceed 10 days past the net period i.e. thirty days. From the schedule of receivables of J Ltd. Account No. 91 and Account No. 114 are currently overdue and for Account No. 123 the average payment period exceeds 40 days. Hence Account Nos. 91, 114 and 123 are eliminated. Therefore, the selected Accounts are Account Nos. 74, 107, 108 and 116.

(ii) Statement showing the calculation of the amount which the bank will lend on a pledge of receivables if the bank uses a 10 per cent allowances for cash discount and returns

| Account No. | Amount (Rs.) | 90 per cent of amount (Rs.) | 80% of amount (Rs.) |
|---|---|---|---|
| | (a) | (b) = 90% of (a) | (c) = 80% of (b) |
| 74 | 25,000 | 22,500 | 18,000 |
| 107 | 11,500 | 10,350 | 8280 |
| 108 | 2,300 | 2,070 | 1,656 |
| 116 | 29,000 | 26,100 | 20,880 |
| Total loan amount | | | 48,816 |

# 9 CHAPTER WORKING CAPITAL

**Q.1** Balance Sheet & W.Cap required | RTP Nov 23

**Consider the following figures and ratios:**

| | | |
|---|---|---|
| (i) | Sales for the year (all credit) | ₹ 1,05,00,000 |
| (ii) | Gross Profit ratio | 35 percent |
| (iii) | Fixed assets turnover (based on cost of goods sold) | 1.5 |
| (iv) | Stock turnover (based on cost of goods sold) | 6 |
| (v) | Liquid ratio | 1.5:1 |
| (vi) | Current ratio | 2.5:1 |
| (vii) | Receivables (Debtors) collection period | 1 month |
| (viii) | Reserves and surplus to Share capital | 1:1.5 |
| (ix) | Capital gearing ratio | 0.7875 |
| (x) | Fixed assets to net worth | 1.3 : 1 |

You are required to PREPARE:

(a) Balance Sheet as on 31/3/2022 based on above details.

(b) The statement showing working capital requirement if the company wants to make a provision for contingencies @ 14 percent of net working capital.

**Ans** Working Notes:

(i) Cost of Goods Sold = Sales – Gross Profit (35% of Sales)
= ₹ 1,05,00,000 – ₹ 36,75,000
= ₹ 68,25,000

(ii) Closing Stock = Cost of Goods Sold / Stock Turnover
$= \frac{68,25,000}{6}$ = ₹ 11,37,500

(iii) Fixed Assets = Cost of Goods Sold / Fixed Assets Turnover
$= \frac{68,25,000}{1.5}$
= ₹ 45,50,000

(iv) Current Assets:
Current Ratio = 2.5 and Liquid Ratio = 1.5
Inventories (Stock) = 2.5 – 1.5 = 1
Current Assets = Amount of Inventories (Stock) x $\frac{2.5}{1}$
= ₹11,37,500 x $\frac{2.5}{1}$ = ₹ 28,43,750

(v) Liquid Assets (Receivables and Cash)
= Current Assets – Inventories (Stock)
= ₹ 28,43,750 – ₹ 11,37,500
= ₹ 17,06,250

(vi) Receivables (Debtors) = Sales x $\frac{\text{Debtors Collection period}}{12}$
= ₹1,05,00,000x $\frac{1}{12}$
= ₹ 8,75,000

(vii) Cash = Liquid Assets – Receivables (Debtors)

= ₹ 17,06,250 – ₹ 8,75,000 = ₹ 8,31,250

(viii) Net worth = $\frac{\text{Fixed Assets}}{1.3}$

= $\frac{45,50,000}{1.3}$ = ₹ 35,00,000

(ix) Reserves and Surplus

Reserves and Share Capital = Net worth

Net worth = 1 + 1.5 = 2.5

Reserves and Surplus = ₹35,00,000 x $\frac{1}{2.5}$

= ₹ 14,00,000

(x) Share Capital = Net worth – Reserves and Surplus

= ₹ 35,00,000 – ₹ 14,00,000

= ₹ 21,00,000

(xi) Current Liabilities = Current Assets/ Current Ratio

= $\frac{28,43,750}{2.5}$ = ₹ 11,37,500

(xii) Long-term Debts

Capital Gearing Ratio = Long-term Debts / Equity Shareholders' Fund

Long-term Debts = ₹ 35,00,000 × 0.7875 = ₹ 27,56,250

**(a) Balance Sheet**

| Particulars | Figures as at 31-03-2022 (₹) | Figures as at 31-03-2021 (₹) |
|---|---|---|
| I. EQUITY AND LIABILITIES | | |
| Shareholders' funds | | |
| (a) Share capital | 21,00,000 | - |
| (b) Reserves and surplus | 14,00,000 | - |
| Non-current liabilities | | |
| (a) Long-term borrowings | 27,56,250 | - |
| Current liabilities | 11,37,500 | - |
| TOTAL | 73,93,750 | - |
| II. ASSETS | | |
| Non-current assets | | |
| Fixed assets | 45,50,000 | - |
| Current assets | | |
| Inventories | 11,37,500 | - |
| Trade receivables | 8,75,000 | - |
| Cash and cash equivalents | 8,31,250 | - |
| TOTAL | 73,93,750 | - |

**(b) Statement Showing Working Capital Requirement**

| Particulars | (₹) | (₹) |
|---|---|---|
| A. Current Assets | | |
| (i) Inventories (Stocks) | | 11,37,500 |

| | | | |
|---|---|---|---|
| | (ii) Receivables (Debtors) | | 8,75,000 |
| | (iii) Cash in hand & at bank | | 8,31,250 |
| | Total Current Assets | | 28,43,750 |
| | B. Current Liabilities:<br>Total Current Liabilities<br>Net Working Capital (A – B) | | <br><br>17,06,250 |
| | Add: Provision for contingencies<br>(14% of Net Working Capital)<br>Working capital requirement | | <br>2,38,875<br>19,45,125 |

**Q.2** Balance Sheet & W.Cap required | RTP Nov 20

**The following figures and ratios are related to a company:**

| | | |
|---|---|---|
| (i) | Sales for the year (all | ₹ 90,00,000 |
| (ii) | credit) Gross Profit ratio | 35 percent |
| (iii) | Fixed assets turnover (based on cost of goods sold) | 1.5 |
| (iv) | Stock turnover (based on cost of goods sold) | 6 |
| (v) | Liquid ratio | 1.5:1 |
| (vi) | Current ratio | 2.5:1 |
| (vii) | Receivables (Debtors) collection period | 1 month |
| (viii) | Reserves and surplus to Share capital | 1:1.5 |
| (ix) | Capital gearing ratio | 0.7875 |
| (x) | Fixed assets to net worth | 1.3 : 1 |

You are required to PREPARE:

(a) Balance Sheet of the company on the basis of above details.

(b) The statement showing working capital requirement, if the company wants to make a provision for contingencies @ 15 percent of net working capital.

**Ans**

(i) Cost of Goods Sold = Sales – Gross Profit (35% of Sales)
= ₹ 90,00,000 – ₹ 31,50,000
= ₹ 58,50,000

(ii) Closing Stock = Cost of Goods Sold / Stock Turnover
= ₹ 58,50,000/6 = ₹ 9,75,000

(iii) Fixed Assets = Cost of Goods Sold / Fixed Assets Turnover
= ₹ 58,50,000/1.5
= ₹ 39,00,000

(iv) Current Assets:
Current Ratio = 2.5 and Liquid Ratio = 1.5
Inventories (Stock) = 2.5 – 1.5 = 1
Current Assets = Amount of Inventories (Stock) × 2.5/1
= ₹ 9,75,000 × 2.5/1 = ₹ 24,37,500

(v) Liquid Assets (Receivables and Cash)
= Current Assets – Inventories (Stock)
= ₹ 24,37,500 – ₹ 9,75,000
= ₹14,62,500

(vi) Receivables (Debtors) = Sales × Debtors Collection period /12
= ₹ 90,00,000 × 1/12
= ₹ 7,50,000

(vii) Cash = Liquid Assets – Receivables (Debtors)
= ₹14,62,500 – ₹ 7,50,000 = ₹ 7,12,500

(viii) Net worth = Fixed Assets /1.3
= ₹ 39,00,000/1.3 = ₹ 30,00,000

(ix) Reserves and Surplus
Reserves and Share Capital = Net worth
Net worth = 1 + 1.5 = 2.5
Reserves and Surplus = ₹ 30,00,000 × 1/1.5
= ₹ 20,00,000

(x) Share Capital = Net worth – Reserves and Surplus
= ₹ 30,00,000 – ₹ 20,00,000
= ₹ 10,00,000

(xi) Current Liabilities = Current Assets/ Current Ratio
= ₹ 24,37,500/2.5 = ₹ 9,75,000

(xii) Long-term Debts
Capital Gearing Ratio = Long-term Debts / Equity Shareholders' Fund
Long-term Debts = ₹30,00,000 × 0.7875 = ₹23,62,500

**(a) Balance Sheet of the Company**

| Particulars | Figures as at 31-03-2020 (₹) | Figures as at 31-03-2019 (₹) |
|---|---|---|
| **I. EQUITY AND LIABILITIES** | | |
| **Shareholders' funds** | | |
| (a) Share capital | 10,00,000 | - |
| (b) Reserves and surplus | 20,00,000 | - |
| **Non-current liabilities** | | |
| (a) Long-term borrowings | 23,62,500 | - |
| **Current liabilities** | 9,75,000 | - |
| **TOTAL** | **63,37,500** | **-** |
| **II. ASSETS** | | |
| **Non-current assets** | | |
| Fixed assets | 39,00,000 | - |
| **Current assets** | | |
| Inventories | 9,75,000 | - |
| Trade receivables | 7,50,000 | - |
| Cash and cash equivalents | 7,12,500 | - |
| **TOTAL** | **63,37,500** | **-** |

**(b) Statement Showing Working Capital Requirement**

| A. Current Assets | (₹) | (₹) |
|---|---|---|
| (i) Inventories (Stocks) | | 9,75,000 |
| (ii) Receivables (Debtors) | | 7,50,000 |
| (iii) Cash in hand & at bank | | 7,12,500 |

| | | | |
|---|---|---|---|
| | Total Current Assets | | 24,37,500 |
| B. | Current Liabilities: | | |
| | Total Current Liabilities | | 9,75,000 |
| | Net Working Capital (A – B) | | 14,62,500 |
| | Add: Provision for contingencies (15% of Net Working Capital) | | 2,19,375 |
| | Working capital requirement | | 16,81,875 |

**Q.3** Max Bank Finance | PY May 22

**Balance sheet of X Ltd for the year ended 31st March, 2022 is given below:**

**(₹ in lakhs)**

| Liabilities | Amount | Assets | Amount |
|---|---|---|---|
| Equity Shares ₹ 10 each | 200 | Fixed Assets | 500 |
| Retained earnings | 200 | Raw materials | 150 |
| 11% Debentures | 300 | W.I.P | 100 |
| Public deposits (Short-Term) | 100 | Finished goods | 50 |
| Trade Creditors | 80 | Debtors | 125 |
| Bills Payable | 100 | Cash/Bank | 55 |
| | 980 | | 980 |

Calculate the amount of maximum permissible bank finance under three methods as per Tandon Committee lending norms.

**Ans**

The total core current assets are assumed to be ₹ 30 lakhs.
Current Assets = 150 + 100 + 50 + 125 + 55 = ₹ 480 Lakhs
Current Liabilities = 100 + 80 + 100 = ₹ 280 Lakhs
Maximum Permissible Banks Finance under Tandon Committee Norms:

Method I
Maximum Permissible Bank Finance = 75% of (Current Assets – Current Liabilities)
= 75% of (480 - 280)
= ₹ 150 Lakhs

Method II
Maximum Permissible Bank Finance = 75% of Current Assets – Current Liabilities
= 75 % of 480 – 280
= ₹ 80 Lakhs

Method III
Maximum Permissible Bank Finance = 75% of (Current Assets – Core Current Assets) – Current Liabilities
= 75 % of (480 - 30) – 280
= ₹ 57.5 Lakhs

**Q.4** Max. Bank Finance | RTP May 23

Kalyan limited has provided you the following information for the year 2021-22:
By working at 60% of its capacity the company was able to generate sales of ₹ 72,00,000. Direct labour cost per unit amounted to ₹ 20 per unit. Direct material cost per unit was 40% of the selling price per unit. Selling price was 3 times the direct labour cost per unit. Profit margin was 25% on the total cost.For the year 2022-23, the company makes the following estimates:

Production and sales will increase to 90% of its capacity. Raw material per unit price will remain unchanged. Direct expense per unit will increase by 50%. Direct labour per unit will increase by 10%. Despite the fluctuations in the cost structure, the company wants to maintain the same profit margin on sales.
Raw materials will be in stock for one month whereas finished goods will remain in stock for two months. Production cycle is for 2 months. Credit period allowed by suppliers is 2 months. Sales are made to three zones:

| Zone | Percentage of sale | Mode of Credit |
|---|---|---|
| A | 50% | Credit period of 2 months |
| B | 30% | Credit period of 3 months |
| C | 20% | Cash Sales |

There are no cash purchases and cash balance will be ₹ 1,11,000
The company plans to apply for a working capital financing from bank for the year 2022-23. ESTIMATE Net Working Capital of the Company receivables to be taken on sales and also COMPUTE the maximum permissible bank finance for the company using 3 criteria of Tandon Committee Norms. (Assume stock of finished goods to be a core current asset)

**Ans**

**Cost Structure**

| | | 2021-22 | | | 2022-23 | |
|---|---|---|---|---|---|---|
| **Particulars** | **Calculations** | **P.U.** | **Amount (p.u. X units)** | **Calculations** | **P.U.** | **Amount (p.u. X units)** |
| Direct | 40% of SP | ₹24 | ₹28,80,000 | Same as PY | ₹24 | ₹43,20,000 |
| Material | | | | | | |
| Direct | Given | ₹20 | ₹24,00,000 | 20*1.1 | ₹22 | ₹39,60,000 |
| labour | | | | | | |
| Direct | bal. fig. | ₹4 | ₹4,80,000 | 4*1.5 | ₹6 | ₹10,80,000 |
| Expenses | | | | | | |
| Total Cost | SP - Profit | ₹48 | ₹57,60,000 | | ₹52 | ₹93,60,000 |
| Profit | (SP/125x25) | ₹12 | ₹14,40,000 | 52*25% | ₹13 | ₹23,40,000 |
| Sales | 3 x Direct | ₹60 | ₹72,00,000 | | ₹65 | ₹1,17,00,000 |
| | Labour p.u. | | | | | |
| *units= | | ₹72,00,000/ ₹60 | | | 1,20,000/60 x90 | |
| | | =1,20,000 | | | =1,80,000 | |

**Operating Cycle**

| | |
|---|---|
| Raw material holding period | 1 months |
| Finished Goods holding period | 2 months |
| WIP conversion period | 2 months |
| Creditor Payment Period | 2 months |
| Receiveable collection Period | 2/3 months |

**Estimation of Working Capital**

| Particulars | Calculation | Amount |
|---|---|---|
| Current Assets | | |
| Stock of Raw Material | 43,20,000 x 1/12 | ₹3,60,000 |
| RM cost | ₹43,20,000 | |
| Labour cost | ₹19,80,000 | |
| Direct Exp cost | ₹5,40,000 | |
| Total WIP Cost | ₹68,40,000 | |
| Stock of WIP | 68,40,000 x 2/12 | ₹11,40,000 |
| Stock of Finished Goods | 93,60,000 x 2/12 | ₹15,60,000 |

| | | |
|---|---|---|
| Receivables (on sales) | | |
| A | 1,17,00,000 x 50% x 2/12 | ₹9,75,000 |
| B | 1,17,00,000 x 30% x 3/12 | ₹8,77,500 |
| C | NIL | - |
| Cash Balance | Given | ₹1,11,000 |
| **Total Current Assets** | | **₹ 50,23,500** |
| **Current Liabilities** | | |
| Payables | * ₹44,40,000 x 2/12 | ₹7,40,000 |
| **Net Working Capital** | | **₹ 42,83,500** |

Opening RM stock = 28,80,000 x 1/12= ₹2,40,000

* RM purchased = RM consumed – Opening Stock + Closing Stock

= ₹43,20,000 – ₹2,40,000 + ₹3,60,000 = ₹44,40,000

| Computation of Maximum Permissible Bank Finance | | | |
|---|---|---|---|
| **Method** | **Formula** | **Calculation** | **₹** |
| I | 75% x (Current Assets-Current Liabilities) | 75% x ( ₹50,23,500 - ₹7,40,000) | ₹32,12,625 |
| I | 75% x Current Assets-Current Liabilities | 75% x ₹50,23,500 - ₹7,40,000 | ₹30,27,625 |
| II | 75% x (Current Assets-Core CA)- Current Liabilities | 75% x ( ₹50,23,500-₹7,40,000 | ₹18,57,625 |

**Q.5** Maximum Bank Finance | MTP Nov 18(2)

A newly formed company has applied to the commercial bank for the first time for financing its working capital requirements. The following information is available about the projections for the current year:

Estimated level of activity: 1,04,000 completed units of production plus 4,000 units of work-in progress. Based on the above activity, estimated cost per unit is:

| | |
|---|---|
| Raw material | Rs. 80 per unit |
| Direct wages | Rs. 30 per unit |
| Overheads (exclusive of depreciation) | Rs. 60 per unit |
| Total cost | Rs. 170 per unit |
| Selling price | Rs. 200 per unit |

Raw materials in stock: Average 4 weeks consumption, work-in-progress (assume 50% completion stage in respect of conversion cost) (materials issued at the start of the processing).

| | |
|---|---|
| Finished goods in stock | 8,000 units |
| Credit allowed by suppliers | Average 4 weeks |
| Credit allowed to debtors/receivables | Average 8 weeks |
| Lag in payment of wages | Average $1\frac{1}{2}$ weeks |

Cash at banks (for smooth operation) is expected to be Rs.25,000

Assume that production is carried on evenly throughout the year (52 weeks) and wages and overheads accrue similarly. All sales are on credit basis only.

CALCULATE

(i) Net Working Capital required;

(ii) Maximum Permissible Bank finance under first and second methods of financing as per Tandon Committee Norms.

**Ans**

**(i) Estimate of the Requirement of Working Capital**

| | (Rs.) | (Rs.) |
|---|---|---|
| **A. Current Assets:** | | |

| | | | |
|---|---|---|---|
| | Raw material stock (Refer to Working note 3) | 6,64,615 | |
| | Work in progress stock (Refer to Working note 2) | 5,00,000 | |
| | Finished goods stock (Refer to Working note 4) Debtors/ Receivables (Refer to Working note 5) Cash and Bank balance | 13,60,000<br>29,53,846<br>25,000 | 55,03,461 |
| B. | **Current Liabilities:** | | |
| | Creditors for raw materials (Refer to Working note 6) Creditors for wages (Refer to Working note 7) | 7,15,740<br>91,731 | (8,07,471) |
| | Net Working Capital (A-B) | | 46,95,990 |

**(ii) The maximum permissible bank finance as per Tandon Committee Norms**

First Method:

75% of the net working capital financed by bank i.e. 75% of Rs.46,95,990 (Refer to (i) above)

= Rs. 35,21,993

Second Method:

(75% of Current Assets) - Current liabilities

= 75% of Rs. 55,03,461 - Rs. 8,07,471 (Refer to (i) above)

= Rs. 41,27,596 – Rs. 8,07,471

= Rs. 33,20,125

Working Notes:

**1. Annual cost of production**

| | Rs. |
|---|---|
| Raw material requirements (1,04,000 units x Rs. 80) | 83,20,000 |
| Direct wages (1,04,000 units x Rs. 30) | 31,20,000 |
| Overheads (exclusive of depreciation) (1,04,000 x Rs. 60) | 62,40,000 |
| | 1,76,80,000 |

**2. Work in progress stock**

| | Rs. |
|---|---|
| Raw material requirements (4,000 units x Rs. 80) | 3,20,000 |
| Direct wages (50% x 4,000 units x Rs. 30) | 60,000 |
| Overheads (50% x4,000 units x Rs.60) | 1,20,000 |
| | 5,00,000 |

**3. Raw material stock**

It is given that raw material in stock is average 4 weeks consumption. Since, the company is newly formed, the raw material requirement for production and work in progress will be issued and consumed during the year.Hence, the raw material consumption for the year (52 weeks) is as follows:

| | Rs. |
|---|---|
| For Finished goods | 83,20,000 |
| For Work in progress | 3,20,000 |
| | 86,40,000 |

Raw material stock $\frac{86,40,000}{52 \text{ weeks}}$ × 4 weeks i.e. Rs. 6,64,615

**4. Finished goods stock**

8,000 units @ Rs. 170 per unit = Rs. 13,60,000

**5. Debtors for sale**

| | |
|---|---|
| Credit allowed to debtors | Average 8 weeks |
| Credit sales for year (52 weeks) i.e. (1,04,000 units-8,000 units) | 96,000 units |
| Selling price per unit | Rs.200 |
| Credit sales for the year (96,000 units XRs. 200) | Rs. 1,92,00,000 |

Debtors $\frac{1,92,00,000}{52 \text{weeks}}$ × 8 weeks i.e. Rs. 29,53,846

(Debtor can also be calculated based on Cost of goods sold)

**6. Creditors for raw material:**

| | |
|---|---|
| Credit allowed by suppliers | Average 4 weeks |
| Purchases during the year (52 weeks) i.e. (Rs. 83,20,000 + Rs. 3,20,000 + Rs. 6,64,615) (Refer to Working notes 1,2 and 3 above) | Rs. 93,04,615 |
| Creditors | $\frac{93,04,615}{52 \text{ weeks}}$ × 4 weeks i.e. Rs. 7,15,740 |

**7. Creditors for wages**

| | |
|---|---|
| Lag in payment of wages | Average $1\frac{1}{2}$ weeks |
| Direct wages for the year (52 weeks) i.e. (Rs. 31,20,000 + Rs. 60,000) (Refer to Working notes 1 and 2 above) | Rs. 31,80,000 |
| Creditors | Rs. $\frac{31,80,000}{52 \text{weeks}}$ X$1\frac{1}{2}$ weeks i.e. Rs. 91,731 |

**Q.6** Net Working Capital | PY May 18

Day Ltd., a newly formed company has applied to the Private Bank for the first time for financing it's Working Capital Requirements. The following informations are available about the projections for the current year:

| | |
|---|---|
| Estimated Level of Activity | Completed Units of Production 31200 plus unit of work in progress 12000 |
| Raw Material Cost | ₹ 40 per unit |
| Direct Wages Cost | ₹ 15 per unit |
| Overhead | ₹ 40 per unit (inclusive of Depreciation ₹10 per unit) |
| Selling Price | ₹ 130 per unit |
| Raw Material in Stock | Average 30 days consumption |
| Work in Progress Stock | Material 100% and Conversion Cost 50% |
| Finished Goods Stock | 24000 Units |
| Credit Allowed by the supplier | 30 days |
| Credit Allowed to Purchasers | 60 days |
| Direct Wages (Lag in payment) | 15 days |
| Expected Cash Balance | ₹ 2,00,000 |

Assume that production is carried on evenly throughout the year (360 days) and wages and overheads accrue similarly. All sales are on the credit basis. You are required to calculate the Net Working Capital Requirement on Cash Cost Basis.

**Ans** **Calculation of Net Working Capital requirement:**

| | (₹) | (₹) |
|---|---|---|
| **A. Current Assets:** | | |
| Inventories: | | |
| Stock of Raw material (Refer to Working note (iii) | 1,44,000 | |
| Stock of Work in progress (Refer to Working note (ii) | 7,50,000 | |
| Stock of Finished goods (Refer to Working note (iv) | 20,40,000 | |
| Debtors for Sales (Refer to Working note (v) | 1,02,000 | |
| Cash | 2,00,000 | |
| Gross Working Capital | 32,36,000 | 32,36,000 |
| **B. Current Liabilities:** | | |
| Creditors for Purchases | 1,56,000 | |
| (Refer to Working note (vi) | | |
| Creditors for wages (Refer to Working note (vii) | 23,250 | |
| | 1,79,250 | 1,79,250 |
| **Net Working Capital (A - B)** | | **30,56,750** |

**Working Notes:**

**(i) Annual cost of production**

| | (₹) |
|---|---|
| Raw material requirements {(31,200 × ₹ 40) + (12,000 x ₹ 40)} | 17,28,000 |
| Direct wages {(31,200 × ₹ 15) +(12,000 X ₹ 15 x 0.5)} | 5,58,000 |
| Overheads (exclusive of depreciation) {(31,200 × ₹ 30) + (12,000 x ₹ 30 x 0.5)} | 11,16,000 |
| Gross Factory Cost | 34,02,000 |
| Less: Closing W.I.P [12,000 ( ₹ 40 + ₹ 7.5 + ₹15)] | (7,50,000) |
| Cost of Goods Produced | 26,52,000 |
| Less: Closing Stock of Finished Goods ( ₹ 26,52,000 × 24,000/31,200) | (20,40,000) |
| Total Cash Cost of Sales | 6,12,000 |

**(ii) Work in progress stock**

| | ( ₹) |
|---|---|
| Raw material requirements (12,000 units × ₹40) | 4,80,000 |
| Direct wages (50% × 12,000 units × ₹ 15) | 90,000 |

| | |
|---|---|
| Overheads (50% × 12,000 units × ₹ 30) | 1,80,000 |
| | 7,50,000 |

**(iii) Raw material stock**

It is given that raw material in stock is average 30 days consumption. Since, the company is newly formed; the raw material requirement for production and work in progress will be issued and consumed during the year. Hence, the raw material consumption for the year (360 days) is as follows:

| | (₹) |
|---|---|
| For Finished goods (31,200 × ₹ 40) | 12,48,000 |
| For Work in progress (12,000 × ₹ 40) | 4,80,000 |
| | 17,28,000 |

Raw material stock = $\frac{17,28,000}{360 days}$ × 30 days = ₹1,44,000

**(iv) Finished goods stock:**

24,000 units @ ₹ (40+15+30) per unit = ₹20,40,000

**(v) Debtors for sale:** ₹ 6,12,000x $\frac{60 \text{ days}}{360 days}$ = ₹1,02,000

**(vi) Creditors for raw material Purchases [Working Note (iii)]:**

| | |
|---|---|
| Annual Material Consumed ( ₹12,48,000 + ₹4,80,000) | ₹17,28,000 |
| Add: Closing stock of raw material | ₹ 1,44,000 |
| | ₹18,72,000 |

Credit allowed by suppliers = $\frac{18,72,000}{360 days}$ × 30days = ₹ 1,56,000

**(vii) Creditors for wages:**

Outstanding wage payment = $\frac{5,58,000}{360 days}$ ×15days = ₹ 23,250

**Q.7** Net Working Capital | MTP May 18

A newly formed company has applied to the commercial bank for the first time for financing its working capital requirements. The following information is available about the projections for the current year:

Estimated level of activity: 1,04,000 completed units of production plus 4,000 units of work -in-progress. Based on the above activity, estimated cost per unit is:

| | |
|---|---|
| Raw material | ₹80 per unit |
| Direct wages | ₹30 per unit |
| Overheads (exclusive of depreciation) | ₹60 per unit |
| Total cost | ₹170 per unit |
| Selling price | ₹200 per unit |

Raw materials in stock: Average 4 weeks consumption, work-in-progress (assume 50% completion stage in respect of conversion cost) (materials issued at the start of the processing).

| | |
|---|---|
| Finished goods in stock | 8,000 units |
| Credit allowed by suppliers | Average 4 weeks |
| Credit allowed to debtors/receivables | Average 8 weeks |
| Lag in payment of wages | Average $1\frac{1}{2}$ weeks |

Cash at banks (for smooth operation) is expected to be ₹25,000Assume that production is carried on evenly throughout the year (52 weeks) and wages and overheads accrue similarly. All sales are on credit basis only. CALCULATE Net Working Capital.

**Ans**

Estimate of the Requirement of Working Capital

**A. Current Assets:**

| | | ( ₹) | ( ₹) |
|---|---|---|---|
| | Raw material stock (Refer to Working note 3) | 6,64,615 | |
| | Work in progress stock (Refer to Working note 2) | 5,00,000 | |
| | Finished goods stock (Refer to Working note 4) | 13,60,000 | |
| | Receivables (Refer to Working note 5) | 25,10,769 | |
| | Cash and Bank balance | 25,000 | 50,60,384 |
| **B.** | **Current Liabilities:** | | |
| | Payables for raw materials (Refer to Working note 6) | 7,15,740 | |
| | Payables for wages (Refer to Working note 7) | 91,731 | (8,07,471) |
| | Net Working Capital (A - B) | | 42,52,913 |

**Working Notes:**

1. Annual cost of production

| | ₹ |
|---|---|
| Raw material requirements (1,04,000 units x ₹ 80) | 83,20,000 |
| Direct wages (1,04,000 units x ₹ 30) | 31,20,000 |
| Overheads (exclusive of depreciation)(1,04,000 x ₹ 60) | 62,40,000 |
| | 1,76,80,000 |

2. Work in progress stock

| | ₹ |
|---|---|
| Raw material requirements (4,000 units x ₹ 80) | 3,20,000 |
| Direct wages (50% x 4,000 units x ₹ 30) | 60,000 |
| Overheads (50% x 4,000 units x ₹ 60) | 1,20,000 |
| | 5,00,000 |

3. Raw material stock
   It is given that raw material in stock is average 4 weeks' consumption. Since, the company is newly formed, the raw material requirement for production and work in progress will be issued and consumed during the year.
   Hence, the raw material consumption for the year (52 weeks) is as follows:

| | ₹ |
|---|---|
| For Finished goods | 83,20,000 |
| For Work in progress | 3,20,000 |
| | 86,40,000 |

   Raw material stock = $\frac{86,40,000}{86,40,000}$ × 4 weeks i.e. ₹ 6,64,615

4. Finished goods stock
   8,000 units @ ₹ 170 per unit = ₹13,60,000
5. Receivables for sale

| | |
|---|---|
| Credit allowed to debtors | Average 8 weeks |
| Credit sales for year (52 weeks) i.e. (1,04,000 units - 8,000 units) | 96,000 units |
| Cost per unit | ₹ 170 |
| Credit sales for the year (96,000 units x ₹170) | ₹ 1,63,20,000 |

Receivables = $\frac{1,63,20,000}{52 \text{ weeks}}$ × 8 weeks i.e. ₹ 25,10,769

6. Payables for raw material:

| | |
|---|---|
| Credit allowed by suppliers | Average 4 weeks |
| Purchases during the year (52 weeks) i.e. ( ₹ 83,20,000 + ₹ 3,20,000 + ₹ 6,64,615) (Refer to Working notes 1,2 and 3 above) | ₹ 93,04,615 |

Payables for raw materials = $\frac{93,04,615}{52 \text{ weeks}}$ × 4 weeks i.e. ₹ 7,15,740

7. Payables for wages

| | |
|---|---|
| Lag in payment of wages | Average $1\frac{1}{2}$ 52 weeks |
| Direct wages for the year (52 weeks) i.e. ( ₹31,20,000 + ₹60,000) (Refer to Working notes 1 and 2 above) | ₹31,80,000 |

Payables for wages = $\frac{31,80,000}{52 \text{ weeks}} \times 1\frac{1}{2}$ weeks i.e. ₹ 91,731

**Q.8** Operating Cycle | PY Jan 21

The following information is provided by MNP Ltd. for the year ending 31st March, 2020:

| | |
|---|---|
| Raw Material Storage period | 45 days |
| Work-in-Progress conversion period | 20 days |
| Finished Goods storage period | 25 days |
| Debt Collection period | 30 days |
| Creditors payment period | 60 days |
| Annual Operating Cost (Including Depreciation of ₹ 2,50,000) | ₹ 25,00,000 |

Assume 360 days in a year. You are required to calculate:

(i) Operating Cycle period

(ii) Number of Operating Cycle in a year.

(iii) Amount of working capital required for the company on a cost basis.

(iv) The company is a market leader in its product and it has no competitor in the market.Based on a market survey it is planning to discontinue sales on credit and deliver products based on pre-payments in order to reduce its working capital requirement substantially. You are required to compute the reduction in working capital requirement in such a scenario.

**Ans**

(i) Calculation of Operating Cycle Period:

Operating Cycle Period = R + W + F + D – C

= 45 + 20 + 25 + 30 – 60 = 60 days

(ii) Number of Operating Cycle in a Year

$= \frac{360}{\text{Operating cycle period}} = \frac{360}{60} = 6$

(iii) Amount of Working Capital Required

$= \frac{\text{Annual operating cost}}{\text{Number of operating cycle}} = \frac{25,00,000 - 2,50,000}{6}$

$= \frac{22,50,000}{6} =$ ₹ 3,75,000

(iv) Reduction in Working Capital

Operating Cycle Period = R + W + F – C

= 45 + 20 + 25 – 60 = 30 days

Amount of Working Capital Required = $\frac{22,50,000}{360}$ x30 = ₹ 1,87,500

Reduction in Working Capital = ₹ 3,75,000 – ₹ 1,87,500 = ₹ 1,87,500

Note: If we use Total Cost basis, then amount of Working Capital required will be ₹ 4,16,666.67 (approx.) and Reduction in Working Capital will be ₹ 2,08,333.33 (approx.)

**Q.9** Operating Cycle | RTP May 18

Following information is forecasted by the Puja Limited for the year ending 31 st March,20X8:

| | Balance as at 1st April, 20X7(₹) | Balance as at 31st March, 20X8(₹) |
|---|---|---|
| Raw Material | 45,000 | 65,356 |
| Work-in-progress | 35,000 | 51,300 |
| Finished goods | 60,181 | 70,175 |
| Debtors | 1,12,123 | 1,35,000 |
| Creditors | 50,079 | 70,469 |
| Annual purchases of raw material (all credit) | | 4,00,000 |
| Annual cost of production | | 7,50,000 |
| Annual cost of goods sold | | 9,15,000 |
| Annual operating cost | | 9,50,000 |
| Annual sales (all credit) | | 11,00,000 |

You may take one year as equal to 365 days.

Required:

CALCULATE

(i) Net operating cycle period.

(ii) Number of operating cycles in the year.

(iii) Amount of working capital requirement using operating cycles.

**Ans**

**Working Notes:**

**1. Raw Material Storage Period (R)**

$$= \frac{\text{Average Stock of RawMaterial}}{\text{Annual Consumption of RawMaterial}} \times 365$$

$$= \frac{\frac{45,000 + 65,356}{2}}{3,79,644} \times 365$$

= 53 days.

Annual Consumption of Raw Material = Opening Stock + Purchases- Closing Stock

= ₹ 45,000 + ₹ 4,00,000 – ₹ 65,356

= ₹ 3,79,644

**2. Work-in-Progress (WIP) Conversion Period (W)**

$$\text{WIP Conversion Period} = \frac{\text{Average Stock of WIP}}{\text{Annual Cost of Production}} \times 365$$

$$= \frac{\frac{35,000 + 51,300}{2}}{7,50,000} \times 365$$

=21 days

**3. Finished Stock Storage Period (F)**

$$= \frac{\text{Average Stock of Finished Goods}}{\text{Cost of Goods Sold}} \times 365$$

$= \frac{65,178}{9,15,000} \times 365 = 26$ days.

Average Stock $= \frac{60,181 + 70,175}{2}$

$=$ ₹ 65,178.

**4. Debtors Collection Period (D)**

$= \frac{\text{Average Debtors}}{\text{Annual Credit Sales}} \times 365$

$= \frac{123,56.50}{11,00,000} \times 365$

$=$ 41 days

Average debtors $= \frac{\frac{1,12,123+1}{35,000}}{2} = 1,23,561.50$

**5. Creditors Payment Period (C)**

$= \frac{\text{Average Creditors}}{\text{Annual Net Credit Purchases}} \times 365$

$= \frac{70,469}{4,00,000} \times 365$

$= 55$ days

**(i) Operating Cycle Period**

$= R + W + F + D - C$

$= 53 + 21 + 26 + 41 - 55$

$= 86$ days

**(ii) Number of Operating Cycles in the Year**

$= \frac{365}{\text{Operating}} = \frac{365}{86} = 4.244$

**(iii) Amount of Working Capital Required**

$= \frac{\text{Annual Operating Cost}}{\text{Number of Operating Cycles}} = \frac{9,50,000}{4.244} =$ ₹2,23,845.42

**Q.10** Operating Cycle | MTP May 22(1)

**Following information is forecasted by Gween Limited for the year ending 31st March, 2022:**

| | Balance as at 31st March, 2022 (₹ in lakh) | Balance as at 31st March, 2021 (₹ in lakh) |
|---|---|---|
| Raw Material | 845 | 585 |
| Work-in-progress | 663 | 455 |
| Finished goods | 910 | 780 |
| Receivables | 1,755 | 1,456 |
| Payables | 923 | 884 |
| Annual purchases of raw material (all credit) | 5,200 | |
| Annual cost of production | 5,850 | |
| Annual cost of goods sold | 6,825 | |
| Annual operating cost | 4,225 | |
| Annual sales (all credit) | 7,605 | |

Considering one year as equal to 365 days, CALCULATE:

(i) Net operating cycle period.
(ii) Number of operating cycles in the year.
(iii) Amount of working capital requirement.

**Ans**

**1. Raw Material Storage Period (R)**

$$= \frac{\text{Average Stock of Raw Material}}{\text{Annual Consumption of Raw Material}} \times 365$$

$$= \frac{\frac{585+845}{2}}{4,940} \times 365 = 53 \text{ days}$$

Annual Consumption of Raw Material = Opening Stock + Purchases - Closing Stock
= ₹ 585 + ₹ 5,200 – ₹ 845 = ₹ 4,940 lakh

**2. Work – in - Progress (WIP) Conversion Period (W)**

$$= \frac{\text{AverageStockofWIP}}{\text{AnnualCostofProduction}} \times 365$$

$$= \frac{\frac{455+663}{2}}{5,850} \times 365 = 35 \text{ days}$$

**3. Finished Stock Storage Period (F)**

$$= \frac{\text{Average Stock of Finished Goods}}{\text{Cost of GoodsSold}} \times 365$$

$$= \frac{\frac{780+910}{2}}{6,825} \times \times 365 = 45 \text{ days.}$$

**4. Receivables (Debtors) Collection Period (D)**

$$= \frac{\text{Average Receivables}}{\text{Annual Credit Sales}} \times 365$$

$$= \frac{\frac{14,56+1,755}{2}}{7,605} \times 365 = 77 \text{ days}$$

**5. Payables (Creditors) Payment Period (C)**

$$= \frac{\text{Average Payablesfor materials}}{\text{Annual Credit purchases}} \times 365$$

$$= \frac{\frac{884+923}{2}}{5200} \times 365 = 64 \text{ days}$$

(i) Net Operating Cycle Period
= R + W + F + D - C
= 53 + 35 + 45 + 77 – 64 = 146 days

(ii) Number of Operating Cycles in the Year

$$= \frac{365}{\text{Operating Cycle Period}} = \frac{365}{146} = 2.5 \text{ times}$$

(iii) Amount of Working Capital Required

$$= \frac{\text{AnnualOperatingCost}}{\text{Number ofOperatingCycles}} = \frac{4,225}{2.5} = ₹ 1,690 \text{ lakh}$$

Note: Number of days may vary due to fraction.

**Q.11** Operating Cycle | MTP May 20

The following information is provided by the P Ltd. for the year ending 31st March, 2020.

| | |
|---|---|
| Raw Material storage period | 52 days |
| Work in progress conversion period | 18 days |

| | |
|---|---|
| Finished Goods storage period | 20 days |
| Debt Collection period | 75 days |
| Creditors' payment period | 25 days |
| Annual Operating Cost | 45 crore |
| (Including depreciation of Rs.42,00,000) | |
| (1 year = 360 days) | |

You are required to CALCULATE Operating Cycle period and Number of Operating Cycles in a year.

**Ans**

**Calculation of Operating Cycle Period and number of Operating Cycle in a Year**

Operating Cycle Period = R + W + F + D – C

= 52 + 18 + 20 + 75 – 25 = 140 days

$$\text{Number of Operating Cycle in a Year} = \frac{360}{\text{Operating Cycle Period}}$$

= 360/140 = 2.57 times

**Q.12** Statement of Working Cap | RTP Nov 19

Following are cost information of KG Ltd., which has commenced a new project for an annual production of 24,000 units which is the full capacity

| | |
|---|---|
| Earnings of the Company | ₹ 50,00,000 |
| Dividend Payout ratio | 60% |
| No. of shares outstanding | 10,00,000 |
| Equity capitalization rate | 12% |
| Rate of return on investment | 15% |

(i) COMPUTE the market value per share as per Walter's model?

(ii) COMPUTE the optimum dividend payout ratio according to Walter's model and the market value of Company's share at that payout ratio?

**Ans**

**(i)** **Projected Statement of Profit / Loss**
**(Ignoring Taxation)**

| | Year 1 | Year 2 |
|---|---|---|
| Production (Units) | 12,000 | 18,000 |
| Sales (Units) | 10,000 | 17,000 |

| | (₹) | (₹) |
|---|---|---|
| Sales revenue (A) (Sales unit × ₹192) | 19,20,000 | 32,64,000 |
| Cost of production: | | |
| Materials cost (Units produced × ₹80) | 9,60,000 | 14,40,000 |
| Direct labour and variable expenses (Units produced × ₹40) | 4,80,000 | 7,20,000 |
| Fixed manufacturing expenses (Production Capacity: 24,000 units × ₹12) | 2,88,000 | 2,88,000 |
| Depreciation (Production Capacity : 24,000 units × ₹20) | 4,80,000 | 4,80,000 |
| Fixed administration expenses (Production Capacity : 24,000 units × ₹8) | 1,92,000 | 1,92,000 |
| Total Costs of Production | 24,00,000 | 31,20,000 |
| Add: Opening stock of finished goods | --- | 4,00,000 |

| | | |
|---|---|---|
| (Year 1 : Nil; Year 2 : 2,000 units) | | |
| Cost of Goods available for sale (Year 1: 12,000 units; Year 2: 20,000 units) | 24,00,000 | 35,20,000 |
| Less: Closing stock of finished goods at average cost (year 1: 2000 units, year 2 : 3000 units) (Cost of Production × Closing stock/ units produced) | (4,00,000) | (5,28,000) |
| Cost of Goods Sold | 20,00,000 | 29,92,000 |
| Add: Selling expenses – Variable (Sales unit × ₹8) | 80,000 | 1,36,000 |
| Add: Selling expenses -Fixed (24,000 units × ₹2) | 48,000 | 48,000 |
| Cost of Sales : (B) | 21,28,000 | 31,76,000 |
| Profit (+) / Loss (-): (A - B) | (-) 2,08,000 | (+) 88,000 |

**Working Notes:**

1. **Calculation of creditors for supply of materials:**

| | Year 1 (₹) | Year 2 (₹) |
|---|---|---|
| Materials consumed during the year | 9,60,000 | 14,40,000 |
| Add: Closing stock (2 month's average consumption) | 1,60,000 | 2,40,000 |
| | 11,20,000 | 16,80,000 |
| Less: Opening Stock | --- | 1,60,000 |

2. **Creditors for expenses:**

| | Year 1 (₹) | Year 2 (₹) |
|---|---|---|
| Direct labour and variable expenses | 4,80,000 | 7,20,000 |
| Fixed manufacturing expenses | 2,88,000 | 2,88,000 |
| Fixed administration expenses | 1,92,000 | 1,92,000 |
| Selling expenses (variable + fixed) | 1,28,000 | 1,84,000 |
| Total | 10,88,000 | 13,84,000 |
| Average per month | 90,667 | 1,15,333 |

**Projected Statement of Working Capital requirements**

| | Year 1 (₹) | Year 2 (₹) |
|---|---|---|
| **Current Assets:** | | |
| Inventories: | | |
| -Stock of materials (2 month's average consumption) | 1,60,000 | 2,40,000 |
| -Finished goods | 4,00,000 | 5,28,000 |
| Debtors (2 month's average sales) (including profit) | 3,20,000 | 5,44,000 |
| Cash | 1,00,000 | 1,00,000 |
| Total Current Assets/ Gross working capital (A) | 9,80,000 | 14,12,000 |
| **Current Liabilities:** | | |
| Creditors for supply of materials (Refer to working note 1) | 93,333 | 1,26,667 |
| Creditors for expenses (Refer to working note 2) | 90,667 | 1,15,333 |
| Total Current Liabilities: (B) | 1,84,000 | 2,42,000 |
| Estimated Working Capital Requirements: (A-B) | 7,96,000 | 11,70,000 |

**Q.13** | Working Cap Requirement | PY Nov 20 |

**PK Ltd., a manufacturing company, provides the following information:**

| | (₹) |
|---|---|
| Sales | 1,08,00,000 |
| Raw Material Consumed | 27,00,000 |
| Labour Paid | 21,60,000 |
| Manufacturing Overhead (Including Depreciation for the year ₹ 3,60,000) | 32,40,000 |
| Administrative & Selling Overhead | 10,80,000 |

Additional Information:

(a) Receivables are allowed 3 months' credit.

(b) Raw Material Supplier extends 3 months' credit.

(c) Lag in payment of Labour is 1 month.

(d) Manufacturing Overhead are paid one month in arrear.

(e) Administrative & Selling Overhead is paid 1 month advance.

(f) Inventory holding period of Raw Material & Finished Goods are of 3 months.

(g) Work-in-Progress is Nil.

(h) PK Ltd. sells goods at Cost plus 33⅓%.

(i) Cash Balance ₹ 3,00,000.

(j) Safety Margin 10%.

You are required to compute the Working Capital Requirements of PK Ltd. on Cash Cost basis.

**Ans**

**Statement showing the requirements of Working Capital (Cash Cost basis)**

| **Particulars** | **(₹)** | **(₹)** |
|---|---|---|
| A. Current Assets: | | |
| Inventory: | | |
| Stock of Raw material ( ₹ 27,00,000 × 3/12) | 6,75,000 | |
| Stock of Finished goods ( ₹ 77,40,000 × 3/12) | 19,35,000 | |
| Receivables ( ₹ 88,20,000 × 3/12) | 22,05,000 | |
| Administrative and Selling Overhead ( ₹ 10,80,000 × 1/12) | 90,000 | |
| Cash in Hand | 3,00,000 | |
| Gross Working Capital | 52,05,000 | 52,05,000 |
| B. Current Liabilities: | | |
| Payables for Raw materials* ( ₹ 27,00,000 × 3/12) | 6,75,000 | |
| Outstanding Expenses: | | |
| Wages Expenses ( ₹ 21,60,000 × 1/12) | 1,80,000 | |
| Manufacturing Overhead ( ₹ 28,80,000 × 1/12) | 2,40,000 | |
| Total Current Liabilities | 10,95,000 | 10,95,000 |
| Net Working Capital (A-B) | | 41,10,000 |
| Add: Safety margin @ 10% | | 4,11,000 |
| Total Working Capital requirements | | 45,21,000 |

**Working Notes:**

**(i)**

| **(A) Computation of Annual Cash Cost of Production** | **(₹)** |
|---|---|
| Raw Material consumed | 27,00,000 |

| | |
|---|---|
| Wages (Labour paid) | 21,60,000 |
| Manufacturing overhead ( ₹ 32,40,000 - ₹ 3,60,000) | 28,80,000 |
| Total cash cost of production | 77,40,000 |

| (B) Computation of Annual Cash Cost of Sales | (₹) |
|---|---|
| Cash cost of production as in (A) above | 77,40,000 |
| Administrative & Selling overhead | 10,80,000 |
| Total cash cost of sales | 88,20,000 |

*Purchase of Raw material can also be calculated by adjusting Closing Stock and Opening Stock (assumed nil). In that case Purchase will be Raw material consumed +Closing Stock -Opening Stock i.e ₹27,00,000 + ₹6,75,000 - Nil = ₹33,75,000. Accordingly, Total Working Capital requirements ( ₹ 43,35,375) can be calculated.

**Q.14** Working Capital Requirement | PY May 19

Bita Limited manufactures used in the steel industry. The following information regarding the company is given for your consideration:

(i) Expected level of production 9000 units per annum.
(ii) Raw materials are expected to remain in store for an average of two months before issue to production.
(iii) Work-in-progress (50 percent complete as to conversion cost) will approximate to 1/2 month's production.
(iv) Finished goods remain in warehouse on an average for one month.
(v) Credit allowed by suppliers is one month.
(vi) Two month's credit is normally allowed to debtors.
(vii) A minimum cash balance of ₹ 67,500 is expected to be maintained.
(viii) Cash sales are 75 percent less than the credit sales.
(ix) Safety margin of 20 percent to cover unforeseen contingencies.
(x) The production pattern is assumed to be even during the year.
(xi) The cost structure for Bita Limited's product is as follows:

| | |
|---|---|
| Raw Materials | 80 per unit |
| Direct Labour | 20 per unit |
| Overheads (including depreciation ₹ 20) | 80 per |
| unit Total Cost | 180 |
| per unit Profit | 20 |
| per unit Selling Price | 200 per unit |

You are required to estimate the working capital requirement of Bita limited.

**Ans** **Statement showing Estimate of Working Capital Requirement**

| | (Amount in ₹) | (Amount in ₹) |
|---|---|---|
| **A. Current Assets** | | |
| (i) **Inventories:** | | |
| - Raw material inventory $\left(\frac{9,000 \text{ units} \times 80}{12\text{months}} \times 2\text{months}\right)$ | | 1,20,000 |
| **- Work in Progress:** | | |
| Raw material $\left(\frac{9,000 \text{ units} \times 20}{12\text{months}} \times 0.5\text{months}\right)$ | 30,000 | |

| | | |
|---|---|---|
| Wages $\left(\frac{9,000 \text{ units} \times 80}{12\text{months}} \times 0.5\text{months}\right) \times 50\%$ | 3,750 | |
| Overheads $\left(\frac{9,000 \text{ units} \times 60}{12\text{months}} \times 0.5\text{months}\right) \times 50$ (Other than Depreciation) | 11,250 | **45,000** |
| **Finished goods** (inventory held for 1 months) $\left(\frac{9,000 \text{ units} \times 160}{12\text{months}} \times 1\text{months}\right)$ | | **1,20,000** |
| (ii) **Debtors (for 2 months)** $\left(\frac{9,000 \text{ units} \times 160}{12\text{months}} \times 2\text{months}\right) \times 80\%$ or $\left(\frac{11,52,000}{12\text{months}} \times 2\text{months}\right)$ | | **1,92,000** |
| (iii) Cash balance expected | | 67,500 |
| Total Current assets | | 5,44,500 |
| **B. Current Liabilities** | | |
| (i) Creditors for Raw material (1 month) $\left(\frac{9,000 \text{ units} \times 80}{12\text{months}} \times 1\text{months}\right)$ | | 60,000 |
| Total current liabilities | | 60,000 |
| Net working capital (A – B) | | 4,84,500 |
| *Add:* Safety margin of 20 percent | | 96,900 |
| Working capital Requirement | | 5,81,400 |

**Working Notes:**

1. If Credit sales is x then cash sales is x-75% of x i.e. x/4.
   Or x+0.25x = ₹ 18,00,000
   Or x= ₹ 14,40,000
   So, credit Sales is ₹ 14,40,000
   Hence, Cash cost of credit sales $\left(\frac{14,40,000}{5} \times 4\right)$ = ₹ 11,52,000
2. It is assumed that safety margin of 20% is on net working capital.
3. No information is given regarding lag in payment of wages, hence ignored assuming it is paid regularly.
4. Debtors/Receivables is calculated based on total cost.
   [If Debtors/Receivables is calculated based on sales, then debtors will be $\left(\frac{9,000 \text{ units} \times 200}{12 \text{ months}} \times 2 \text{ month}\right) \times 80\% \left(\frac{14,\ 40,\ 000}{12 \text{ months}} \times 2 \text{ month}\right)$ = ₹2,40,000

Then Total Current assets will be ₹ 5,92,500 and accordingly Net working capital and Working capital requirement will be ₹ 5,32,500aand ₹ 6,39,000 respectively].

**Q.15** Working Capital Requirement | RTP Nov 22

**Trading and Profit and Loss Account of Beat Ltd. for the year ended 31st March, 2022 is given below:**

| Particulars | Amount(₹) | Amount(₹) | Particulars | Amount(₹) | Amount(₹) |
|---|---|---|---|---|---|
| To Opening Stock: | | | By Sales (Credit) | | 1,60,00,000 |
| - Raw Materials | 14,40,000 | | By Closing Stock: | | |
| - Work-in- progress | 4,80,000 | | - Raw Materials | 16,00,000 | |
| - Finished Goods | 20,80,000 | 40,00,000 | - Work-inprogress | 8,00,000 | |
| To Purchases (credit) | | 88,00,000 | - Finished Goods | 24,00,000 | 48,00,000 |
| To Wages | | 24,00,000 | | | |
| To Production Exp. | | 16,00,000 | | | |
| To Gross Profit c/d | | 40,00,000 | | | |
| | | 2,08,00,000 | | | 2,08,00,000 |
| To Administration Exp. | | 14,00,000 | By Gross Profitb/d | | 40,00,000 |
| To Selling Exp. | | 6,00,000 | | | |
| To Net Profit | | 20,00,000 | | | |
| | | 40,00,000 | | | 40,00,000 |

The opening and closing payables for raw materials were ₹ 16,00,000 and ₹ 19,20,000 respectively whereas the opening and closing balances of receivables were ₹ 12,00,000 and ₹ 16,00,000 respectively.
You are required to ASCERTAIN the working capital requirement by operating cycle method.

**Ans**

**Computation of Operating Cycle**

(1) Raw Material Storage Period (R)

$$\text{Raw Material Storage Period (R)} = \frac{\text{Average Stock of Raw Material}}{\text{Daily Average Consumption of Raw material}}$$

$$= \frac{(14,40,000 + 16,00,000) / 2}{86,40,000 / 365} = 64.21 \text{ Days}$$

Raw Material Consumed = Opening Stock + Purchases – Closing Stock

= ₹ 14,40,000+ ₹ 88,00,000– ₹ 16,00,000 = ₹ 86,40,000

(2) Conversion/Work-in-Process Period (W)

$$\text{Conversion/Processing Period} = \frac{\text{AverageStock of WIP}}{\text{Daily Average Pr oduction}}$$

$$= \frac{(4,80,000 + 8,00,000) / 2}{1,23,20,000 / 365} = 18.96 \text{ days}$$

| Production Cost: | ₹ |
|---|---|
| Opening Stock of WIP | 4,80,000 |
| Add: Raw Material Consumed | 86,40,000 |
| Add: Wages | 24,00,000 |
| Add: Production Expenses | 16,00,000 |
| | 1,31,20,000 |
| Less: Closing Stock of WIP | 8,00,000 |
| Production Cost | 1,23,20,000 |

(3) Finished Goods Storage Period (F)

$$\text{Finished Goods Storage Period} = \frac{\text{Average Stock of Finished Goods}}{\text{Daily Average Cost of Good Sold}}$$

$$= \frac{(20,80,000 + 24,00,000) / 2}{1,20,00,000 / 365} = 68.13 \text{ Days}$$

| Cost of Goods Sold | ₹ |
|---|---|
| Opening Stock of Finished Goods | 20,80,000 |
| Add: Production Cost | 1,23,20,000 |
| | 1,44,00,000 |
| Less: Closing Stock of Finished Goods | (24,00,000) |
| | 1,20,00,000 |

(4) Receivables Collection Period (D)

$$\text{Receivables Collection Period} = \frac{\text{Average Receivables}}{\text{Daily averagecredit sales}}$$

$$= \frac{(12,00,000 + 16,00,000) / 2}{1,60,00,000 / 365} = 31.94 \text{ Days}$$

(5) Payables Payment Period (C)

$$\text{Payables Payment Period} = \frac{\text{Average Payable}}{\text{Daily averagecredit sales}}$$

$$= \frac{(16,00,000 + 19,20,000) / 2}{88,00,000 / 365} = 73 \text{ Days}$$

(6) Duration of Operating Cycle (O)

O = R + W + F + D – C

= 64.21 + 18.96 + 68.13 + 31.94 – 73

= 110.24 days

Computation of Working Capital

(i) Number of Operating Cycles per Year

= 365/Duration Operating Cycle = 365/110.24 = 3.311

(ii) Total Operating Expenses

| | ₹ |
|---|---|
| Total Cost of Goods sold | 1,20,00,000 |
| Add: Administration Expenses | 14,00,000 |
| Add: Selling Expenses | 6,00,000 |
| | 1,40,00,000 |

(iii) Working Capital Required

$$\text{Working Capital Required} = \frac{\text{Total Operating Expenses}}{\text{Number of Operating Cycles per year}}$$

$$= \frac{1,40,00,000}{3.311} = ₹\ 42,28,329.81$$

**Q.16** Working Capital Requirement | RTP July 21

MT Ltd. has been operating its manufacturing facilities till 31.3.202 1 on a single shift working with the following cost structure:

| | Per unit (₹) |
|---|---|
| Cost of Materials | 24 |
| Wages (out of which 60% variable) | 20 |
| Overheads (out of which 20% variable) | 20 |
| | 64 |

| | |
|---|---|
| Profit | 8 |
| Selling Price | 72 |

As at 31.3.2021 with the sales of ₹ 17,28,000, the company held:

| | (₹) |
|---|---|
| Stock of raw materials (at cost) | 1,44,000 |
| Work-in-progress (valued at prime cost) Finished | 88,000 |
| goods (valued at total cost) Sundry debtors | 2,88,000 |
| | 4,32,000 |

In view of increased market demand, it is proposed to double production by working an extra shift. It is expected that a 10% discount will be available from suppliers of raw materials in view of increased volume of business. Selling price will remain the same. The credit period allowed to customers will remain unaltered. Credit availed from suppliers will continue to remain at the present level i.e. 2 months. Lag in payment of wages and overheads will continue to remain at one month.

You are required to CALCULATE the additional working capital requirements, if the policy to increase output is implemented, to assess the impact of double shift for long term as a matter of production policy.

**Ans**

(1) Statement of cost at single shift and double shift working

| | 24,000 units | | 48,000 Units | |
|---|---|---|---|---|
| | Per unit (₹) | Total (₹) | Per unit (₹) | Total (₹) |
| Raw materials | 24 | 5,76,000 | 21.6 | 10,36,000 |
| Wages: | | | | |
| Variable | 12 | 2,88,000 | 12 | 5,76,000 |
| Fixed | 8 | 1,92,000 | 4 | 1,92,000 |
| Overheads: | | | | |
| Variable | 4 | 96,000 | 4 | 1,92,000 |
| Fixed | 16 | 3,84,000 | 8 | 3,84,000 |
| Total cost | 64 | 15,36,000 | 49.6 | 23,80,800 |
| Profit | 8 | 1,92,000 | 22.4 | 10,75,200 |
| Sales | 72 | 17,28,000 | 72 | 34,56,000 |

(2) Sales in units 2020-21 = $\frac{\text{Sales}}{\text{Unit sellingprice}} = \frac{17,28,000}{72}$ = 24,000 units

(3) Stock of Raw Materials in units on 31.3.2021

$= \frac{\text{Value of stock}}{1,44,000}$ = 6,000 units

Cost per unit ₹ 24

(4) Stock of work-in-progress in units on 31.3.2021

$= \frac{\text{Value of work}-\text{in}-\text{progress}}{\text{PrimeCost per unit}} = \frac{88,000}{(24+20)}$ =2,000units

(5) Stock of finished goods in units 2020-213

$= \frac{\text{Value of stock}}{\text{TotalCost per unit}} = \frac{2,88,000}{64}$ = 4,500 units.

**Comparative Statement of Working Capital Requirement**

| | Single Shift (24,000 units) | | | Double Shift (48,000 units) | | |
|---|---|---|---|---|---|---|
| | Units | Rate (₹) | Amount (₹) | Units | Rate (₹) | Amount (₹) |
| **Current Assets** | | | | | | |
| Inventories: | | | | | | |
| Raw Materials | 6,000 | 24 | 1,44,000 | 12,000 | 21.6 | 2,59,200 |
| Work-in-Progress | 2,000 | 44 | 88,000 | 2,000 | 37.6 | 75,200 |
| Finished Goods | 4,500 | 64 | 2,88,000 | 9,000 | 49.6 | 4,46,400 |
| Sundry Debtors | 6,000 | 64 | 3,84,000 | 12,000 | 49.6 | 5,95,200 |
| Total Current Assets (A) | | | 9,04,000 | | | 13,76,000 |
| **Current Liabilities** | | | | | | |
| Creditors for Materials | 4,000 | 24 | 96,000 | 8,000 | 21.6 | 1,72,800 |
| Creditors for Wages | 2,000 | 20 | 40,000 | 4,000 | 16 | 64,000 |
| Creditors for Overheads | 2,000 | 20 | 40,000 | 4,000 | 12 | 48,000 |
| Total Current Liabilities (B) | | | 1,76,000 | | | 2,84,800 |
| **Working Capital (A) – (B)** | | | **7,28,000** | | | **10,91,200** |

Analysis: Additional Working Capital requirement = ₹ 10,91,200 – ₹ 7,28,000 = ₹3,63,200, if the policy to increase output is implemented.

**Q.17** Working Capital Requirement | MTP Nov23(2)

Cost sheet of X&Y Ltd. provides the following particulars:

| | Amount per unit (₹) |
|---|---|
| Raw materials cost | 260.00 |
| Direct labour cost | 125.00 |
| Overheads cost | 200.00 |
| Total cost | 585.00 |
| Profit | 75.00 |
| Selling Price | 660.00 |

The Company keeps raw material in stock, on an average for four weeks; work -in-progress, on an average for one week; and finished goods in stock, on an average for two weeks.

The credit allowed by suppliers is three weeks and company allow four weeks credit to its debtors. The lag in payment of wages is one week and lag in payment of overhead expenses is two weeks.

The Company sells one-fifth of the output against cash and maintains cash-in-hand and at bank put together at ₹ 2,70,000.

Required:

PREPARE a statement showing estimate of Working Capital needed to finance an activity level of 2,40,000 units of production. Assume that production is carried on evenly throughout the year, and wages and overheads accrue similarly. Work-in-progress stock is 75% complete in all respects.

**Ans**

**Statement showing Estimate of Working Capital Needs**

| | (Amount in ₹) | (Amount in ₹) |
|---|---|---|
| **A. Current Assets** | | |
| (i) Inventories: | | |
| Raw material (4 weeks) | | |

| | | |
|---|---|---|
| $\left(\frac{2,40,000 \text{ units} \times 260}{52 \text{ weeks}} \times 4\text{Weeks}\right)$ | 48,00,000 | |
| WIP Inventory (1 week) $\left(\frac{2,40,000 \text{ units} \times 585}{52 \text{ weeks}} \times 1\text{Weeks}\right) \times 0.75$ | 20,25,000 | |
| Finished goods inventory (2 weeks) $\left(\frac{2,40,000 \text{ units} \times 585}{52 \text{ weeks}} \times 2\text{Weeks}\right)$ | 54,00,000 | 1,22,25,000 |
| (ii) Receivables (Debtors) (4 weeks) $\left(\frac{2,40,000 \text{ units} \times 585}{52 \text{ weeks}} \times 4\text{Weeks}\right) \times \frac{4}{5}$ | | 86,40,000 |
| (iii) Cash and bank balance | | 2,70,000 |
| Total Current Assets | | 2,11,35,000 |
| **B. Current Liabilities:** | | |
| (i) Payables (Creditors) for materials (3 weeks) $\left(\frac{2,40,000 \text{ units} \times 125}{52 \text{ weeks}} \times 3\text{Weeks}\right)$ | | 36,00,000 |
| (ii) Outstanding wages (1 week) $\left(\frac{2,40,000 \text{ units} \times 125}{52 \text{ weeks}} \times 1\text{Weeks}\right)$ | | 5,76,923 |
| (iii) Outstanding overheads (2 weeks) $\left(\frac{2,40,000 \text{ units} \times 125}{52 \text{ weeks}} \times 2\text{Weeks}\right)$ | | 18,46,154 |
| Total Current Liabilities | | 60,23,077 |
| Net Working Capital Needs (A – B) | | 1,51,11,923 |

**Q.18** Working Capital Requirement | MTP Nov 23(2)

The following information is provided by the Shrishti Ltd. for the year ending 31st March 2022.

| | |
|---|---|
| Raw Material storage period | 54 days |
| Work in progress conversion period | 20 days |
| Finished Goods storage period | 22 days |
| Debt Collection period | 74 days |
| Creditors' payment period | 25 days |
| Annual Operating Cost (Including depreciation of ₹42,00,000) | 45 crore |

(1 year = 360 days)

You are required to CALCULATE Operating Cycle period and Number of Operating Cycles in a year.

**Ans** Calculation of Operating Cycle Period and number of Operating Cycle in a Year

Operating Cycle Period = R + W + F + D – C

= 54 + 20 + 22 + 74 – 25 = 145 days

Number of Operating Cycle in a Year = $\frac{360}{\text{Operating Cycle Period}}$

= 360/145 = 2.48 times

**Q.19** Working Capital Requirement | MTP May 22(2)

The following annual figures relate to manufacturing entity:

| | | |
|---|---|---|
| A. | Sales at one month credit | 84,00,000 |
| B. | Material consumption | 60% of sales value |
| C. | Wages (paid in a lag of 15 days) | 12,00,000 |
| D. | Cash Manufacturing Expenses | 3,00,000 |
| E. | Administrative Expenses | 2,40,000 |
| F. | Creditors extend 3 months credit for payment. | |
| G. | Cash manufacturing and administrative expenses are paid 1 months in arrear. | |

The company maintains stock of raw material equal to economic order quantity. The company incurs ₹ 100 as per ordering cost per order and opportunity cost of capital is 15% p.a. The optimum cash balance is determined using Baumol's model. The bank charges ₹ 10 for each cash withdrawal. Finished goods are held in stock for 1 month. The company maintains a bank balance of ₹12,00,000 on an average. Creditors are paid through net banking and all other expenses are incurred in cash which is withdrawn from bank.

Assuming a 20% safety margin, you are required to ESTIMATE the amount of working capital that needs to be invested by the Company.

**Ans** Statement of working capital Requirement

| **Particular** | **(₹)** | **(₹)** |
|---|---|---|
| **A. Current Assets** | | |
| Stock of Raw Material (W.N. 2) | 81,975 | |
| Stock of finished Goods $\left(65,40,000x\ \frac{1}{12}\right)$ | 5,45,000 | |
| Average Receivables (at Cost) $\left(67,80,000x\ \frac{1}{12}\right)$ | 5,65,000 | |
| Bank Balance | 12,00,000 | |
| Cash Balance (W.N. 3) | 15,232 | |
| Gross Working Capital | | 24,07,207 |
| **B. Current Liabilities** | | |
| Average Creditor for materials $\left(50,40,000x\ \frac{3}{12}\right)$ | 12,60,000 | |
| Outstanding Wages $\left(12,00,000x\ \frac{0.5}{12}\right)$ | 50,000 | |
| Outstanding Cash Manufacturing Expenses $\left(3,00,000x\ \frac{1}{12}\right)$ | 25,000 | |
| Outstanding administrative Expenses $\left(240,000x\ \frac{1}{12}\right)$ | 20,000 | |
| | | 13,55,000 |
| Net Working Capital (A-B) | | 10,52,207 |
| dd: Safety Margin @ 20% | | 2,10,441 |
| **Total Working Capital Requirement** | | **12,62,648** |

Working Notes:

1. Computation of annual cash Cost of Production & Sales

| | |
|---|---|
| Material Consumed (84,00,000 × 60%) | 50,40,000 |
| Wages | 12,00,000 |
| Manufacturing expenses | 3,00,000 |
| Cash Cost of production | 65,40,000 |
| (+) Administrative Expenses | 2,40,000 |
| Cash Cost of Sales | 67,80,000 |

2. Computation of stock of Raw Material

A = 50,40,000

B = 100

C = 0.15

$EOQ = \sqrt{\frac{2AB}{c}} = \sqrt{\frac{2x50,40,000x100}{0.15}} = ₹\ 81,975$

3. Calculation of Cash Balance

A = 12,00,000+3,00,000+2,40,000

A = 17,40,000

B = 10

C = 0.15

Optimal Cash Balance $= \sqrt{\frac{2AB}{c}} = \sqrt{\frac{2x17,40,000x10}{0.15}} = ₹\ 15,232$

**Q.20** Working Capital Requirements | MTP May 20

Cost sheet of A&R Ltd. provides the following particulars:

| | Amount per unit (Rs.) |
|---|---|
| Raw materials cost | 200.00 |
| Direct labour cost | 75.00 |
| Overheads cost | 150.00 |
| Total cost | 425.00 |
| Profit | 75.00 |
| Selling Price | 500.00 |

The Company keeps raw material in stock, on an average for four weeks; work-in-progress, on an average for one week; and finished goods in stock, on an average for two weeks.

The credit allowed by suppliers is three weeks and company allows four weeks credit to its debtors. The lag in payment of wages is one week and lag in payment of overhead expenses is two weeks.

The Company sells one-fifth of the output against cash and maintains cash-in-hand and at bank put together at Rs.2,50,000.

Required:

PREPARE a statement showing estimate of Working Capital needed to finance an activity level of 2,60,000 units of production. Assume that production is carried on evenly throughout the year, and wages and overheads accrue similarly. Work-in-progress stock is 80% complete in all respects.

**Ans**

**Statement showing Estimate of Working Capital Needs**

| | (Amount in Rs.) | (Amount in Rs.) |
|---|---|---|
| **A. Current Assets** | | |
| (i) Inventories: | | |
| Raw material (4 weeks) $\left(\frac{2,60,000 units \times Rs.200}{52 weeks} x4 weeks\right)$ | 40,00,000 | |

| | | |
|---|---|---|
| WIP Inventory (1 week) $\left(\frac{2,60,000 units \times Rs.425}{52 weeks} x1 weeks\right) \times 0.8$ | 17,00,000 | |
| Finished goods inventory (2 weeks) $\left(\frac{2,60,000 units \times Rs.425}{52 weeks} x2 weeks\right)$ | 42,50,000 | 99,50,000 |
| (ii) Receivables (Debtors) (4 weeks) $\left(\frac{2,60,000 units \times Rs.425}{52 weeks} x2 weeks\right) x\frac{4}{5}$ | | 68,00,000 |
| (iii) Cash and bank balance | | 2,50,000 |
| Total Current Assets | | 1,70,00,000 |
| **B. Current Liabilities:** | | |
| (i) Payables (Creditors) for materials (3 weeks) $\left(\frac{2,60,000 units \times Rs.200}{52 weeks} x3 weeks\right)$ | | 30,00,000 |
| (ii) Outstanding wages (1 week) $\left(\frac{2,60,000 units \times Rs.75}{52 weeks} x1 weeks\right)$ | | 3,75,000 |
| (iii) Outstanding overheads (2 weeks) $\left(\frac{2,60,000 units \times Rs.150}{52 weeks} x2 weeks\right)$ | | 15,00,000 |
| Total Current Liabilities | | 48,75,000 |
| Net Working Capital Needs (A – B) | | 1,21,25,000 |

**Q.21** Cash Cost Basis | RTP July 21

While applying for financing of working capital requirements to a commercial bank, TN Industries Ltd. projected the following information for the next year:

| Cost Element | Per unit (₹) | Per unit (₹) |
|---|---|---|
| Raw materials | | |
| X | 30 | |
| Y | 7 | |
| Z | 6 | 43 |
| Direct Labour | | 25 |
| Manufacturing and administration overheads (excluding depreciation) | | 20 |
| Depreciation | | 10 |
| Selling overheads | | 15 |
| | | 113 |

Additional Information:

(a) Raw Materials are purchased from different suppliers leading to different credit period allowed as follows:

X – 2 months; Y– 1 months; Z – ½ month

(b) Production cycle is of ½ month. Production process requires full unit of X and Y in the beginning of the production. Z is required only to the extent of half unit in the beginning and the remaining half unit is needed at a uniform rate during the production process.

(c) X is required to be stored for 2 months and other materials for 1 month. (d) Finished goods are held for 1 month.

(e) 25% of the total sales is on cash basis and remaining on credit basis. The credit allowed by debtors is 2 months.

(f) Average time lag in payment of all overheads is 1 months and ½ months for direct labour.

(g) Minimum cash balance of ₹ 8,00,000 is to be maintained.

CALCULATE the estimated working capital required by the company on cash cost basis if the budgeted level of activity is 1,50,000 units for the next year. The company also intends to increase the estimated working capital requirement by 10% to meet the contingencies. (You may assume that production is carried on evenly throughout the year and direct labour and other overheads accrue similarly.)

**Ans** **Statement showing Working Capital Requirements of TN Industries Ltd. (on cash cost basis)**

| | Amount in( ₹) | Amount in(₹) |
|---|---|---|
| **A. Current Assets** | | |
| (i) Inventories: | | |
| Raw material | | |
| $x\left(\frac{1,50,000units \times Rs.30}{12\ months} x2months\right)$ | 7,50,000 | |
| $y\left(\frac{1,50,000units \times 7}{12\ months} x1months\right)$ | 87,500 | |
| $z\left(\frac{1,50,000units \times 6}{12\ months} x1months\right)$ | 75,000 | |
| $WIP\left(\frac{1,50,000units \times 64}{12\ months} x0.5months\right)$ | 4,00,000 | |
| Finished goods $\left(\frac{1,50,000units \times 88}{12\ months} x1months\right)$ | 11,00,000 | 24,12,500 |
| (ii) Receivables (Debtors) $\left(\frac{1,50,000units \times 103}{12\ months} x2months\right) \times 0.75$ | | 19,31,250 |
| (iii) Cash and bank balance | | 8,00,000 |
| **Total Current Assets** | | **51,43,750** |
| **B. Current Liabilities:** | | |
| (i) Payables (Creditors) for Raw materials | | |
| $X\left(\frac{1,50,000units \times 30}{12\ months} x2months\right)$ | 7,50,000 | |
| $Y\left(\frac{1,50,000units \times 7}{12\ months} x1months\right)$ | 87,500 | |
| $Z\left(\frac{1,50,000units \times 6}{12\ months} x0.5months\right)$ | 37,500 | 8,75,000 |

| | | |
|---|---|---|
| (ii) Outstanding Direct Labour $\left(\frac{1,50,000 units \times 25}{12 \text{ months}} \times 1 months\right)$ | | 1,56,250 |
| (iii) Outstanding Manufacturing and administration overheads $\left(\frac{1,50,000 units \times 20}{12 \text{ months}} \times 1 months\right)$ | | 2,50,000 |
| (iv) Outstanding Selling overheads $\left(\frac{1,50,000 units \times 15}{12 \text{ months}} \times 1 months\right)$ | | 1,87,500 |
| **Total Current Liabilities** | | **14,68,750** |
| **Net Working Capital Needs (A – B)** | | **36,75,000** |
| **Add:** Provision for contingencies @ 10% | | 3,67,500 |
| **Working capital requirement** | | **40,42,500** |

**Workings:**

1.

| **(i) Computation of Cash Cost of Production** | **Per unit (₹)** |
|---|---|
| Raw Material consumed | 43 |
| Direct Labour | 25 |
| Manufacturing and administration overheads | 20 |
| Cash cost of production | 88 |
| **(ii) Computation of Cash Cost of Sales** | **Per unit (₹)** |
| Cash cost of production as in (i) above | 88 |
| Selling overheads | 15 |
| Cash cost of sales | 103 |

2. **Calculation of cost of WIP**

| **Particulars** | **Per unit (₹)** |
|---|---|
| Raw material (added at the beginning): X | 30 |
| Y | 7 |
| Z (₹ 6 x 50%) | 3 |
| Cost during the year: | |
| Z {(₹ 6 x 50%) x 50%} | 1.5 |
| Direct Labour (₹ 25 x 50%) | 12.5 |
| Manufacturing and administration overheads (₹ 20 x 50%) | 10 |
| | 64 |

**Q.22** Cash Cost Basis | RTP May 20

Day Ltd., a newly formed company has applied to the Private Bank for the first time for financing it's Working Capital Requirements. The following information is available about the projections for the current year:

| | |
|---|---|
| Estimated Level of Activity | Completed Units of Production 31,200 plus unit of work in progress 12,000 |
| Raw Material Cost | ₹ 40 per unit |
| Direct Wages Cost | ₹ 15 per unit |
| Overhead | ₹ 40 per unit (inclusive of Depreciation ₹10 per unit) |
| Selling Price | ₹ 130 per unit |

| | |
|---|---|
| Raw Material in Stock | Average 30 days consumption |
| Work in Progress Stock | Material 100% and Conversion Cost 50% |
| Finished Goods Stock | 24,000 Units |
| Credit Allowed by the supplier | 30 days |
| Credit Allowed to Purchasers | 60 days |
| Direct Wages (Lag in payment) | 15 days |
| Expected Cash Balance | ₹ 2,00,000 |

Assume that production is carried on evenly throughout the year (360 days) and wages and overheads accrue similarly. All sales are on the credit basis. You are required to CALCULATE the Net Working Capital Requirement on Cash Cost Basis.

**Ans**

**Calculation of Net Working Capital requirement:**

| | (₹) | (₹) |
|---|---|---|
| A. Current Assets: | | |
| Inventories: | | |
| Stock of Raw material (Refer to Working note (iii) | 1,44,000 | |
| Stock of Work in progress (Refer to Working note (ii) | 7,50,000 | |
| Stock of Finished goods (Refer to Working note (iv) | 20,40,000 | |
| Debtors for Sales(Refer to Working note (v) | 1,02,000 | |
| Cash | 2,00,000 | |
| Gross Working Capital | 32,36,000 | 32,36,000 |
| B. Current Liabilities: | | |
| Creditors for Purchases (Refer to Working note (vi) | 1,56,000 | |
| Creditors for wages (Refer to Working note (vii) | 23,250 | |
| | 1,79,250 | 1,79,250 |
| Net Working Capital (A - B) | | 30,56,750 |

Working Notes:

(i) Annual cost of production

| | (₹) |
|---|---|
| Raw material requirements {(31,200 × ₹ 40) + (12,000 x ₹ 40)} | 17,28,000 |
| Direct wages {(31,200 × ₹ 15) +(12,000 X ₹ 15 x 0.5)} | 5,58,000 |
| Overheads (exclusive of depreciation) {(31,200 × ₹ 30) + (12,000 x ₹ 30 x 0.5)} | 11,16,000 |
| Gross Factory Cost | 34,02,000 |
| Less: Closing W.I.P [12,000 ( ₹ 40 + ₹ 7.5 + ₹15)] | (7,50,000) |
| Cost of Goods Produced | 26,52,000 |
| Less: Closing Stock of Finished Goods ( ₹ 26,52,000 × 24,000/31,200) | (20,40,000) |
| Total Cash Cost of Sales* | 6,12,000 |

[*Note: Alternatively, Total Cash Cost of Sales = (31,200 units – 24,000 units) x ( ₹ 40+ ₹ 15 + ₹ 30) = ₹ 6,12,000]

(ii) Work in progress stock

| | (₹) |
|---|---|
| Raw material requirements (12,000 units × ₹40) | 4,80,000 |
| Direct wages (50% × 12,000 units × ₹ 15) | 90,000 |
| Overheads (50% × 12,000 units × ₹ 30) | 1,80,000 |

| | |
|---|---|
| | 7,50,000 |

(iii) Raw material stock

It is given that raw material in stock is average 30 days consumption. Since, the company is newly formed; the raw material requirement for production and work in progress will be issued and consumed during the year. Hence, the raw materi al consumption for the year (360 days) is as follows:

| | (₹) |
|---|---|
| For Finished goods (31,200 × ₹ 40) | 12,48,000 |
| For Work in progress (12,000 × ₹ 40) | 4,80,000 |
| | 17,28,000 |

Raw material stock = $\frac{17,28,000}{360 days}$ × 30 days = ₹1,44,000

(iv) Finished goods stock:

24,000 units @ ₹ (40+15+30) per unit = ₹20,40,000

(v) Debtors for sale: ₹ 6,12,000x $\frac{60 \text{ days}}{360 days}$ = ₹1,02,000

(vi) Creditors for raw material Purchases [Working Note (iii)]:

| | |
|---|---|
| Annual Material Consumed ( ₹12,48,000 + ₹4,80,000) | ₹17,28,000 |
| Add: Closing stock of raw material [( ₹17,28,000 x 30 days) / 360 days] | ₹ 1,44,000 |
| | ₹18,72,000 |

Credit allowed by suppliers = $\frac{18,72,000}{360 days}$ × 30days = ₹ 1,56,000

(vii) Creditors for wages:

Outstanding wage payment = [(31,200 units x ₹ 15) + (12,000 units x ₹ 15 x .50)] x 15 days / 360 days

= $\frac{5,58,000}{360 days}$ ×15days = ₹ 23,250

**Q.23** Working Capital Estimate | RTP May 22

PQR Ltd., a company newly commencing business in the year 2021-22, provides the following projected Profit and Loss Account:

| | (₹) | (₹) |
|---|---|---|
| Sales | | 5,04,000 |
| Cost of goods sold | | 3,67,200 |
| Gross Profit | | 1,36,800 |
| Administrative Expenses | 33,600 | |
| Selling Expenses | 31,200 | 64,800 |
| Profit before tax | | 72,000 |
| Provision for taxation | | 24,000 |
| Profit after tax | | 48,000 |
| The cost of goods sold has been arrived at as under: | | |
| Materials used | 2,01,600 | |
| Wages and manufacturing Expenses | 1,50,000 | |
| Depreciation | 56,400 | |
| | 4,08,000 | |
| Less: Stock of Finished goods (10% of goods produced not yet sold) | 40,800 | |
| | 3,67,200 | |

The figure given above relate only to finished goods and not to work-in-progress. Goods equal to 15% of the year's production (in terms of physical units) will be in process on the average requiring full materials but only 40% of the other expenses. The company believes in keeping materials equal to two months' consumption in stock.

All expenses will be paid one month in advance. Suppliers of materials will extend 1 -1/2 months credit. Sales will be 20% for cash and the rest at two months' credit. 70% of the Income tax will be paid in advance in quarterly instalments. The company wishes to keep ₹ 19,200 in cash. 10% must be added to the estimated figure for unforeseen contingencies. PREPARE an estimate of working capital.

**Ans**

**Statement showing the requirements of Working Capital**

| | Particulars | (₹) | (₹) |
|---|---|---|---|
| **A.** | **Current Assets:** | | |
| | Inventory: | | |
| | Stock of Raw material ( ₹ 2,31,840 × 2/12) | 38,640 | |
| | Stock of Work-in-progress (As per Working Note) | 39,240 | |
| | Stock of Finished goods ( ₹ 3,51,600 × 10/100) | 35,160 | |
| | Receivables (Debtors) ( ₹3,04,992 × 2/12) | 50,832 | |
| | Cash in Hand | 19,200 | |
| | Prepaid Expenses: | | |
| | Wages & Mfg. Expenses ( ₹ 1,59,000 × 1/12) | 13,250 | |
| | Administrative expenses ( ₹ 33,600 × 1/12) | 2,800 | |
| | Selling & Distribution Expenses ( ₹ 31,200 × 1/12) | 2,600 | |
| | Advance taxes paid {(70% of ₹ 24,000) × 3/12} | 4,200 | |
| | Gross Working Capital | 2,05,922 | 2,05,922 |
| **B.** | **Current Liabilities:** | | |
| | Payables for Raw materials ( ₹ 2,70,480 × 1.5/12) | 33,810 | |
| | Provision for Taxation (Net of Advance Tax) ( ₹ 24,000 × 30/100) | 7,200 | |
| | Total Current Liabilities | 41,010 | 41,010 |
| **C.** | **Excess of CA over CL** | | 1,64,912 |
| | Add: 10% for unforeseen contingencies | | 16,491 |
| **Net Working Capital requirements** | | | 1,81,403 |

**Working Notes:**

**(i) Calculation of Stock of Work-in-progress**

| Particulars | (₹) |
|---|---|
| Raw Material ( ₹ 2,01,600 × 15%) | 30,240 |
| Wages & Mfg. Expenses ( ₹ 1,50,000 × 15% × 40%) | 9,000 |
| Total | 39,240 |

**(ii) Calculation of Stock of Finished Goods and Cost of Sales**

| Particulars | (₹) |
|---|---|
| Direct material Cost [ ₹ 2,01,600 + ₹ 30,240] | 2,31,840 |
| Wages & Mfg. Expenses [ ₹ 1,50,000 + ₹ 9,000] | 1,59,000 |
| Depreciation | 0 |
| Gross Factory Cost | 3,90,840 |
| Less: Closing W.I.P. | (39,240) |
| Cost of goods produced | 3,51,600 |
| Add: Administrative Expenses | 33,600 |
| | 3,85,200 |
| Less: Closing stock | (35,160) |
| Cost of Goods Sold | 3,50,040 |
| Add: Selling and Distribution Expenses | 31,200 |
| Total Cash Cost of Sales | 3,81,240 |

| | |
|---|---|
| Debtors (80% of cash cost of sales) | 3,04,992 |

**(iii) Calculation of Credit Purchase**

| Particulars | (₹) |
|---|---|
| Raw material consumed | 2,31,840 |
| Add: Closing Stock | 38,640 |
| Less: Opening Stock | - |
| Purchases | 2,70,480 |

**Q.24** Working Capital Estimate | RTP Dec 21

The management of Trux Company Ltd. is planning to expand its business and consults you to prepare an estimated working capital statement. The records of the company reveals the following annual information:

| | (₹) |
|---|---|
| Sales – Domestic at one month's credit | 18,00,000 |
| Export at three month's credit (sales price 10% below domestic price) | 8,10,000 |
| Materials used (suppliers extend two months credit) | 6,75,000 |
| Lag in payment of wages – ½ month | 5,40,000 |
| Lag in payment of manufacturing expenses (cash) – 1 month | 7,65,000 |
| Lag in payment of Administration Expenses – 1 month | 1,80,000 |
| Selling expenses payable quarterly in advance | 1,12,500 |
| Income tax payable in four installments, of which one falls in the next financial year | 1,68,000 |

Rate of gross profit is 20%. Ignore work-in-progress and depreciation.
The company keeps one month's stock of raw materials and finished goods (each) and believes in keeping ₹2,50,000 available to it including the overdraft limit of ₹ 75,000 not yet utilized by the company.
The management is also of the opinion to make 10% margin for contingencies on computed figure.
You are required to PREPARE the estimated working capital statement for the next year.

**Ans** **Preparation of Statement of Working Capital Requirement for Trux Company Ltd.**

| | (₹) | (₹) |
|---|---|---|
| **A. Current Assets** | | |
| (i) Inventories: | | |
| Material (1 month) $\left(\frac{6,75,000}{12 months} x 1 \text{ month}\right)$ | 56,250 | |
| Finished goods (1 month) $\left(\frac{21,60,000}{12 months} x 1 \text{ month}\right)$ | 1,80,000 | 2,36,250 |
| (ii) Receivables (Debtors) | | |
| For Domestic Sales $\left(\frac{15,17,586}{12 months} x 1 \text{ month}\right)$ | 1,26,466 | |
| (iii) Prepayment of Selling expenses $\left(\frac{1,12,500}{12 months} x 3 \text{ month}\right)$ | | 28,125 |
| (iii) Cash in hand & at bank | | 1,75,000 |
| Total Current Assets | | 7,54,570 |

| B. Current Liabilities: | | |
|---|---|---|
| (i) Payables (Creditors) for materials (2 months) $\left(\frac{6,75,000}{12 months} x 2 \text{ month}\right)$ | | 1,12,500 |
| (ii) Outstanding wages (0.5 months) $\left(\frac{5,40,000}{12 months} x 0.5 \text{ month}\right)$ | | 22,500 |
| (iii) Outstanding manufacturing expenses $\left(\frac{7,65,000}{12 months} x 1 \text{ month}\right)$ | | 63,750 |
| (iv) Outstanding administrative expenses $\left(\frac{1,80,000}{12 months} x 1 \text{ month}\right)$ | | 15,000 |
| (v) Income tax payable | | 42,000 |
| Total Current Liabilities | | 2,55,750 |
| Net Working Capital (A – B) | | 4,98,820 |
| Add: 10% contingency margin | | 49,882 |
| Total Working Capital required | | 5,48,702 |

**Working Notes:**

1. **Calculation of Cost of Goods Sold and Cost of Sales**

| | Domestic (₹) | Export (₹) | Total (₹) |
|---|---|---|---|
| Domestic Sales | 18,00,000 | 8,10,000 | 26,10,000 |
| Less: Gross profit @ 20% on domestic sales and 11.11% on export sales (Working note-2) | 3,60,000 | 90,000 | 4,50,000 |
| Cost of Goods Sold | 14,40,000 | 7,20,000 | 21,60,000 |
| Add: Selling expenses (Working note-3) | 77,586 | 34,914 | 1,12,500 |
| Cash Cost of Sales | 15,17,586 | 7,54,914 | 22,72,500 |

2. **Calculation of gross profit on Export Sales**
   Let domestic selling price is ₹ 100. Gross profit is ₹ 20, and then cost per unit is ₹ 80
   Export price is 10% less than the domestic price i.e. ₹ 100 – (1- 0.1) = ₹ 90
   Now, gross profit will be = ₹ 90 - ₹ 80 = ₹ 10
   So, Gross profit ratio at export price will be = $\frac{10}{90} x100 = 11.11\%$

3. **Apportionment of Selling expenses between Domestic and Exports sales:**
   Apportionment on the basis of sales value:
   Domestic Sales = $\frac{1,12,500}{26,10,000}$ x 18,00,000 = ₹ 77,586
   Exports Sales = $\frac{1,12,500}{26,10,000}$ x ₹ 8,10,000 = ₹ 34,914

4. **Assumptions**
   (i) It is assumed that administrative expenses is related to production activities.
   (ii) Value of opening and closing stocks are equal.

**Q.25** Working Capital Estimate | MTP Nov 22(2)

PREPARE a working capital estimate to finance an activity level of 52,000 units a year (52 weeks) based on the following data:
Raw Materials - ₹ 400 per unit
Direct Wages - ₹ 150 per unit
Overheads (Manufacturing) - ₹200 per unit
Overheads (Selling & Distribution) - ₹100perunit
Selling Price - ₹ 1,000 per unit, Raw materials & Finished Goods remain in stock for 4 weeks, Work in process takes 4 weeks. Debtors are allowed 8 weeks for payment whereas creditors allow us 4 weeks.
Minimum cash balance expected is ₹50,000. Receivables are valued at Selling Price.

**Ans**

| Cost Structure for 52000 units | |
|---|---|
| **Particulars** | **Amount (₹)** |
| Raw Material @ ₹ 400P | 2,08,00,000 |
| Direct Wages @ ₹ 150 | 78,00,000 |
| Manufacturing Overheads@ ₹ 200 | 1,04,00,000 |
| Selling and Distribution OH@ ₹ 100 | 52,00,000 |
| Total Cost | 4,42,00,000 |
| Sales@ ₹1000 | 5,20,00,000 |

| **Particulars** | **Calculation** | **Amount (₹)** |
|---|---|---|
| **A. Current Assets:** | | |
| Raw Material Stock | $2,08,00,000 \times \frac{4}{52}$ | 16,00,000 |
| Work in Progress (WIP) Stock | $2,08,00,000 + \frac{(78,00,000 + 1,04,00,000)}{2} \times \frac{4}{52}$ | 23,00,000 |
| Finished Goods Stock | $4,42,00,000 \times \frac{4}{52}$ | 34,00,000 |
| Receivables | $5,20,00,000 \times \frac{8}{52}$ | 80,00,000 |
| Cash | | 50,000 |
| **B. Current Liabilities:** | Total Current Assets | 1,53,50,000 |
| Creditors | $20800000 \times \frac{4}{52}$ | 16,00,000 |
| C. **Working Capital Estimates(A-B)** | | 1,37,50,000 |

**Q.26** Working Capital Estimate | MTP Dec 21(2)

On 01st April, 2020, the Board of Director of ABC Ltd. wish to know the amount of working capital that will be required to meet the programme they have planned for the year. From the following information, PREPARE a working capital requirement forecast and a forecast profit and loss account and balance sheet:
Issued share capital ₹ 6,00,000

| | |
|---|---|
| 10% Debentures | ₹ 1,00,000 |
| Fixed Assets | ₹ 4,50,000 |

Production during the previous year was 1,20,000 units; it is planned that this level of activity should be maintained during the present year.
The expected ratios of cost to selling price are: raw materials 60%, direct wages 10% overheads 20% Raw materials are expected to remain in store for an average of two months before issue to production. Each unit of production is expected to be in process for one month. The time lag in wage payment is one month.
Finished goods will stay in the warehouse awaiting dispatch to customers for approximately three months.
Credit allowed by creditors is two months from the date of delivery of raw materials. Credit given to debtors is three months from the date of dispatch.
Selling price is ₹ 5 per unit.
There is a regular production and sales cycle and wages and overheads accrue evenly.

**Ans**

**Forecast Profit and Loss Account for the period 01.04.2020 to 31.03.2021**

| Particulars | ₹ | Particulars | ₹ |
|---|---|---|---|
| Materials consumed 1,20,000 @ ₹ 3 | 3,60,000 | By Sales 1,20,000 @ ₹ 5 | 6,00,000 |
| Direct wages : | 60,000 | | |
| Overheads : 1,20,000 @ ₹ 1 | 1,20,000 | | |
| Gross profit c/d | 60,000 | | |
| | 6,00,000 | | 6,00,000 |
| Debenture interest (10% of 1,00,000) | 10,000 | By gross profit b/d | 60,000 |
| Net profit c/d | 50,000 | | |
| | 60,000 | | 60,000 |

**Working Capital Requirement Forecast for the year 01.04.2020 to 31.03.2021**

| Particulars | Period (Months) | Total (₹) | Current Assets (₹) | | | | Current Liabilities(₹) |
|---|---|---|---|---|---|---|---|
| | | | Raw materials | Work-in-progress | Finished goods | Debtors | Creditors |
| **1.Material** | | | | | | | |
| In store | 2 | | 60,000 | | | | |
| In work-in-progress | 1 | | | 30,000 | | | |
| In finished goods | 3 | | | | 90,000 | | |
| Credit to debtors | 3 | | | | | 90,000 | |
| | 9 | | | | | | |
| Less : Credit from creditors | 2 | | | | | | 60,000 |
| **Net block period** | 7 | **2,10,000** | | | | | |
| **2. Wages:** | | | | | | | |
| In work-in- | 1/2 | | | 2,500 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| progress | | | | | | | |
| In finished goods | 3 | | | | 15,000 | | |
| Credit to debtors | 3 | | | | | 15,000 | |
| | $6\frac{1}{2}$ | | | | | | |
| Less : Time lag in payment | 1 | | | | | | 5,000 |
| **Net block period** | **$5\frac{1}{2}$** | **27,500** | | | | | |
| **3.Overhead** | | | | | | | |
| In work-in-progress | $\frac{1}{2}$ | | | 5,000 | | | |
| In finished goods | 3 | | | | 30,000 | | |
| Credit to debtors | 3 | | | | | 30,000 | |
| **Net block period** | **$6\frac{1}{2}$** | **65,000** | | | | | |
| **4.Profit** | | | | | | | |
| Credit to debtors | 3 | | | | | 15,000 | |
| **Net block period** | **3** | **15,000** | | | | | |
| **Total (₹)** | | **3,17,500** | **60,000** | **37,500** | **1,35,000** | **1,50,000** | **65,000** |

**Forecast Balance Sheet as on 31.03.2021**

| | (₹) | | | (₹) |
|---|---|---|---|---|
| Issued share capital | 6,00,000 | Fixed Assets | | 4,50,000 |
| Profit and Loss A/c | 50,000 | Current Assets: | | |
| 10% Debentures | 1,00,000 | Stock: | | |
| Sundry creditors | 65,000 | Raw materials | 60,000 | |
| Bank overdraft- | | Work-in-progress | 37,500 | |
| Balancing figure | 17,500 | Finished goods | 1,35,000 | 2,32,500 |
| | | Debtors | | 1,50,000 |
| | | | | |
| | 8,32,500 | | | 8,32,500 |

The Total amount of working capital, thus, stands as follows:

| | ₹ |
|---|---|
| Requirement as per working capital | 3,17,500 |
| Less: Bank overdraft as per balance sheet | 17,500 |
| Net requirement | **3,00,000** |

**Notes:**

1. Average monthly production: 1,20,000 ÷ 12 = 10,000 units
2. Average cost per month:
   - Raw Material 10,000 × (₹ 5 × 0.6) = ₹ 30,000
   - Direct wages 10,000 × (₹ 5 × 0.1) = ₹ 5,000
   - Overheads 10,000 × (₹ 5 × 0.2) = ₹ 10,000

3. Average profit per month: 10,000 × ( ₹ 5 × 0.1) = ₹ 5,000
4. Wages and overheads accrue evenly over the period and, hence, are assumed to be completely introduced for half the processing time.

**Q.27** Working Capital Estimate | RTP May 19

A company is considering its working capital investment and financial policies for the next year. Estimated fixed assets and current liabilities for the next year are ₹ 2.60 crores and ₹ 2.34 crores respectively. Estimated Sales and EBIT depend on current assets investment, particularly inventories and book-debts. The Financial Controller of the company is examining the following alternative Working Capital Policies:

| Working Capital Policy | Investment in Current Assets | Estimated Sales | EBIT |
|---|---|---|---|
| Conservative | 4.50 | 12.30 | 1.23 |
| Moderate | 3.90 | 11.50 | 1.15 |
| Aggressive | 2.60 | 10.00 | 1.00 |

the adoption of the moderate working capital policy. The company is now examining the use of long-term and short-term borrowings for financing its assets. The company will use ₹ 2.50 crores of the equity funds. The corporate tax rate is 35%. The company is considering the following debt alternatives.

| Financing Policy | Short-term Debt | Long-term Debt |
|---|---|---|
| Conservative | 0.54 | 1.12 |
| Moderate | 1.00 | 0.66 |
| Aggressive | 1.50 | 0.16 |
| Interest rate-Average | 12% | 16% |

You are required to CALCULATE the following:

(i) Working Capital Investment for each policy:
   (a) Net Working Capital position
   (b) Rate of Return
   (c) Current ratio

(ii) Financing for each policy:
   (a) Net Working Capital position.
   (b) Rate of Return on Shareholders' equity.
   (c) Current ratio.

**Ans**

**(i) Statement showing Working Capital Investment for each policy**

| | Working Capital Policy | | |
|---|---|---|---|
| | Conservative | Moderate | Aggressive |
| Current Assets: (i) | 4.50 | 3.90 | 2.60 |
| Fixed Assets: (ii) | 2.60 | 2.60 | 2.60 |
| Total Assets: (iii) | 7.10 | 6.50 | 5.20 |
| Current liabilities: (iv) | 2.34 | 2.34 | 2.34 |
| Net Worth: (v) = (iii) - (iv) | 4.76 | 4.16 | 2.86 |
| Total liabilities: (iv) + (v) | 7.10 | 6.50 | 5.20 |
| Estimated Sales: (vi) | 12.30 | 11.50 | 10.00 |
| EBIT: (vii) | 1.23 | 1.15 | 1.00 |
| (a) Net working capital position: (i) - (iv) | 2.16 | 1.56 | 0.26 |
| (b) Rate of return: (vii) /(iii) | 17.32% | 17.69% | 19.23% |
| (c) Current ratio: (i)/ (iv) | 1.92 | 1.67 | 1.11 |

**(ii) Statement Showing Effect of Alternative Financing Policy**

**(₹in crore)**

| Financing Policy | Conservative | Moderate | Aggressive |
|---|---|---|---|
| Current Assets (i) | 3.90 | 3.90 | 3.90 |
| Fixed Assets (ii) | 2.60 | 2.60 | 2.60 |
| Total Assets (iii) | 6.50 | 6.50 | 6.50 |
| Current Liabilities (iv) | 2.34 | 2.34 | 2.34 |
| .Short term Debt (v) | 0.54 | 1.00 | 1.50 |
| Total current liabilities | 2.88 | 3.34 | 3.84 |
| (vi) = (iv) + (v) | | | |
| Long term Debt (vii) | 1.12 | 0.66 | 0.16 |
| Equity Capital (viii) | 2.50 | 2.50 | 2.50 |
| Total liabilities (ix) = (vi)+(vii)+(viii) | 6.50 | 6.50 | 6.50 |
| Forecasted Sales | 11.50 | 11.50 | 11.50 |
| EBIT (x) | 1.15 | 1.15 | 1.15 |
| Less: Interest on short-term debt | 0.06 | 0.12 | 0.18 |
| | (12% of ₹0.54) | (12% of ₹ 1) | (12% of ₹ 1.5) |
| Interest on long term debt | 0.18 | 0.11 | 0.03 |
| | (16% of ₹1.12) | (16% of ₹0.66) | (16% of ₹0.16) |
| Earnings before tax (EBT) (xi) | 0.91 | 0.92 | 0.94 |
| Taxes @ 35% (xii) | 0.32 | 0.32 | 0.33 |
| Earnings after tax: (xiii) = (xi) – (xii) | 0.59 | 0.60 | 0.61 |
| (a) Net Working Capital Position: (i) - [(iv) + (v)] | 1.02 | 0.56 | 0.06 |
| (b) Rate of return on shareholders Equity capital : 23.6% (xiii)/ (viii) | | 24.0% | 24.4% |
| (c) Current Ratio (i) / (vi) | 1.35 | 1.17 | 1.02 |

**Q.28** Working Capital Estimate | RTP Nov 18

A company is considering its working capital investment and financial policies for the next year. Estimated fixed assets and current liabilities for the next year are ₹ 2.60 crores an ₹ 2.34 crores respectively. Estimated Sales and EBIT depend on current assetsinvestment, particularly inventories and book-debts. The financial controller of the company is examining the following alternative Working Capital Policies:

| Working Capital Policy | Investment in Current Assets | Estimated Sales | EBIT |
|---|---|---|---|
| Conservative | 4.50 | 12.30 | 1.23 |
| Moderate | 3.90 | 11.50 | 1.15 |
| Aggressive | 2.60 | 10.00 | 1.00 |

After evaluating the working capital policy, the Financial Controller has advised the adoption of the moderate working capital policy. The company is now examining the use of long-term and short-term borrowings for

financing its assets. The company will use ₹ 2.50 crores of the equity funds. The corporate tax rate is 35%. The company is considering the following debt alternatives.

(₹Crores)

| Financing Policy | Short-term Debt | Long-term Debt |
|---|---|---|
| Conservative | 0.54 | 1.12 |
| Moderate | 1.00 | 0.66 |
| Aggressive | 1.50 | 0.16 |
| Interest rate-Average | 12% | 16% |

You are required to CALCULATE the following:

(i) Working Capital Investment for each policy:
- (a) Net Working Capital position
- (b) Rate of Return
- (c) Current ratio

(ii) Financing for each policy:
- (a) Net Working Capital position.
- (b) Rate of Return on Shareholders' equity.
- (c) Current ratio.

**Ans** **(i) Statement showing Working Capital for each policy**

(₹ in crores)

| | Working Capital Policy | | |
|---|---|---|---|
| | Conservative | Moderate | Aggressive |
| Current Assets: (i) | 4.50 | 3.90 | 2.60 |
| Fixed Assets: (ii) | 2.60 | 2.60 | 2.60 |
| Total Assets: (iii) | 7.10 | 6.50 | 5.20 |
| Current liabilities: (iv) | 2.34 | 2.34 | 2.34 |
| Net Worth: (v)=(iii)-(iv) | 4.76 | 4.16 | 2.86 |
| Total liabilities: (iv)+(v) | 7.10 | 6.50 | 5.20 |
| Estimated Sales: (vi) | 12.30 | 11.50 | 10.00 |
| EBIT: (vii) | 1.23 | 1.15 | 1.00 |
| (a) Net working capital position: (i)-(iv) | 2.16 | 1.56 | 0.26 |
| (b) Rate of return: (vii)/(iii) | 17.3% | 17.7% | 19.2% |
| (c) Current ratio: (i)/(iv) | 1.92 | 1.67 | 1.11 |

**(ii) Statement Showing Effect of Alternative Financing Policy**

(₹ in crores)

| Financing Policy | Conservative | Moderate | Aggressive |
|---|---|---|---|
| Current Assets: (i) | 3.90 | 3.90 | 3.90 |
| Fixed Assets: (ii) | 2.60 | 2.60 | 2.60 |
| Total Assets: (iii) | 6.50 | 6.50 | 6.50 |
| Current Liabilities: (iv) | 2.34 | 2.34 | 2.34 |
| Short term Debt: (v) | 0.54 | 1.00 | 1.50 |
| Long term Debt: (vi) | 1.12 | 0.66 | 0.16 |
| Equity Capital (vii) | 2.50 | 2.50 | 2.50 |
| Total liabilities | 6.50 | 6.50 | 6.50 |
| Forecasted Sales | 11.50 | 11.50 | 11.50 |
| EBIT: (viii) | 1.15 | 1.15 | 1.15 |
| Less: Interest short-term debt: | 0.06 | 0.12 | 0.18 |

| | | | |
|---|---|---|---|
| (ix) | (12% of ₹ 0.54) | (12% of ₹ 1.00) | (12% of ₹ 1.50) |
| Long term debt: (x) | 0.18 | 0.11 | 0.03 |
| | (16% of ₹ 1.12) | (16% of ₹ 0.66) | (16% of ₹ 0.16) |
| Earning before tax: (xi) - (ix + x) | 0.91 | 0.92 | 0.94 |
| Tax @ 35% | (0.32) | (0.32) | (0.33) |
| Earning after tax: (xii) | 0.59 | 0.60 | 0.61 |
| (a) Net Working Capital Position: (i) - [(iv)+(v)] | 1.02 | 0.56 | 0.06 |
| (b) Rate of return on Equity shareholders' capital : (xii)/(vii) | 23.6% | 24% | 24.4% |
| (c) Current Ratio: [(i)/(iv)+(v)] | 1.35 | 1.17 | 1.02 |

**Q.29** Working Capital Estimate | RTP May 19

**A proforma cost sheet of a company provides the following particulars:**

| | Amount per unit (₹) |
|---|---|
| Raw materials cost | 100.00 |
| Direct labour cost | 37.50 |
| Overheads cost | 75.00 |
| Total cost | 212.50 |
| Profit | 37.50 |
| Selling Price | 250.00 |

The Company keeps raw material in stock, on an average for one month; work-in-progress, on an average for one week; and finished goods in stock, on an average for two weeks.

The credit allowed by suppliers is three weeks and company allows four weeks credit to its debtors. The lag in payment of wages is one week and lag in payment of overhead expenses is two weeks.

The Company sells one-fifth of the output against cash and maintains cash-in-hand and at bank put together at ₹37,500.

Required:

PREPARE a statement showing estimate of Working Capital needed to finance an activity level of 1,30,000 units of production. Assume that production is carried on evenly throughout the year, and wages and overheads accrue similarly. Work-in-progress stock is 80% complete in all respects.

**Ans**

**Statement showing Estimate of Working Capital Needs**

| | (Amount in ₹) | (Amount in ₹) |
|---|---|---|
| **A. Current Assets** | | |
| (i) Inventories: | | |
| Raw material (1 month or 4 weeks) $\left(\frac{1,30,000 units \times 100}{52 weeks} \times 4 weeks\right)$ | 10,00,000 | |
| WIP Inventory (1 week) $\left(\frac{1,30,000 units \times 212.50}{52 weeks} \times 1 weeks\right) \times 0.8$ | 4,25,000 | |
| Finished goods inventory (2 weeks) | 10,62,500 | 24,87,500 |

| | | |
|---|---|---|
| $\left(\frac{1,30,000 units \times 212.50}{52 \text{ weeks}} \times 2 weeks\right)$ | | |
| (ii) Receivables (Debtors) (4 weeks) $\left(\frac{1,30,000 units \times 212.50}{52 \text{ weeks}} \times 4 weeks\right) \times \frac{4}{5}$ | | 17,00,000 |
| (iii) Cash and bank balance | | 37,500 |
| Total Current Assets | | 42,25,000 |
| **B. Current Liabilities:** | | |
| (i) Payables (Creditors) for materials (3 weeks) $\left(\frac{1,30,000 units \times 100}{52 \text{ weeks}} \times 3 weeks\right)$ | | 7,50,000 |
| (ii) Outstanding wages (1 week) $\left(\frac{1,30,000 units \times 37.50}{52 \text{ weeks}} \times 1 weeks\right)$ | | 93,750 |
| (iii) Outstanding overheads (2 weeks) $\left(\frac{1,30,000 units \times 75}{52 \text{ weeks}} \times 2 weeks\right)$ | | 3,75,000 |
| Total Current Liabilities | | 12,18,750 |
| Net Working Capital Needs (A – B) | | 30,06,250 |

# 10 CHAPTER
# INVESTING DECISION

**Q.1** Accept Mutually Excl. Project | PY May 19

Kanoria Enterprises wishes to evaluate two mutually exclusive projects X and Y.
The particulars are as under :

| | Project X | Project Y |
|---|---|---|
| Initial Investment | 1,20,000 | 1,20,000 |
| Estimated cash inflows (per annum for 8 years) | | |
| Pessimistic | 26,000 | 12,000 |
| Most Likely | 28,000 | 28,000 |
| Optimistic | 36,000 | 52,000 |

The cut off rate is 14%. The discount factor at 14% are :

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Discount factor | 0.877 | 0.769 | 0.675 | 0.592 | 0.519 | 0.456 | 0.400 | 0.351 | 0.308 |

Advise management about the acceptability of projects X and Y.

**Ans.** The possible outcomes of Project x and Project y are as follows

| Estimates | Project X | | | | Project Y | | | |
|---|---|---|---|---|---|---|---|---|
| | Estimated Annual Cash inflows (₹) | PVF @ 14% for 8 years | PV of Cash flow (₹) | NPV (₹) | Estimated Annual Cash inflows (₹) | PVF @ 14% for 8 years | PV of Cash flow (₹) | NPV (₹) |
| **Pessimistic** | 26,000 | 4.639 | 1,20,614 | **614** | 12,000 | 4.639 | 55,668 | **(-64,332)** |
| **Most likely** | 28,000 | 4.639 | 1,29,892 | **9,892** | 28,000 | 4.639 | 1,29,892 | **9,892** |
| **Optimistic** | 36,000 | 4.639 | 2,41,228 | **47,004** | 52,000 | 4.639 | 2,41,228 | **1,21,228** |

In pessimistic situation project X will be better as it gives low but positive NPV whereas Project Y yield highly negative NPV under this situation. In most likely situation both the project will give same result. However, in optimistic situation Project Y will be better as it will gives very high NPV. So, project X is a risk less project as it gives positive NPV in all the situation whereas Y is a risky project as it will result into negative NPV in pessimistic situation and highly positive NPV in optimistic situation. So acceptability of project will largely depend on the risk taking capacity (Risk seeking/ Risk aversion) of the management.

**Q.2** NPV Method (Accept/Not) | RTP May 23

Dharma Ltd, an existing profit-making company, is planning to introduce a new product with a projected life of 8 years. Initial equipment cost will be ₹ 240 lakhs and additional equipment costing ₹ 26 lakhs will be needed at the beginning of third year. At the end of 8 years, the original equipment will have resale value equivalent to the cost of removal, but the additional equipment would be sold for ₹ 2 lakhs. Working Capital of ₹ 25 lakhs will be needed at the beginning of the operations. The 100% capacity of the plant is of 4,00,000 units per annum, but the production and sales volume expected are as under:

| Year | Capacity (%) |
|---|---|
| 1 | 20 |

| | |
|---|---|
| 2 | 30 |
| 3-5 | 75 |
| 6-8 | 50 |

A sale price of ₹ 100 per unit with a profit volume ratio (contribution/sales) of 60% is likely to be obtained. Fixed operating cash cost are likely to be ₹ 16 lakhs per annum. In addition to this the advertisement expenditure will have to be incurred as under:

| **Year** | 1 | 2 | 3-5 | 6-8 |
|---|---|---|---|---|
| **Expenditure (₹ Lakhs each year)** | 30 | 15 | 10 | 4 |

The company is subjected to 50% tax rate and consider 12% to be an appropriate cost of capital. Straight line method of depreciation is followed by the company. ADVISE the management on the desirability of the project.

**Ans.**

**Calculation of Cash Flow After tax**

| | Year | 1 | 2 | 3 to 5 | 6 to 8 |
|---|---|---|---|---|---|
| A | Capacity | 20% | 30% | 75% | 50% |
| B | Units | 80000 | 120000 | 300000 | 200000 |
| C | Contribution p.u. | ₹60 | ₹60 | ₹60 | ₹60 |
| D | Contribution | ₹48,00,000 | ₹72,00,000 | ₹1,80,00,000 | ₹1,20,00,000 |
| E | Fixed Cash Cost | ₹16,00,000 | ₹16,00,000 | ₹16,00,000 | ₹16,00,000 |
| | Depreciation | | | | |
| F | Original Equipment (₹240Lakhs/8) | ₹30,00,000 | ₹30,00,000 | ₹30,00,000 | ₹30,00,000 |
| G | Additional Equipment (₹24Lakhs/6) | -- | -- | ₹4,00,000 | ₹4,00,000 |
| H | Advertisement Expenditure | ₹30,00,000 | ₹15,00,000 | ₹10,00,000 | ₹4,00,000 |
| I | Profit Before Tax (D- E-F-G-H) | ₹ (28,00,000) | ₹11,00,000 | ₹1,20,00,000 | ₹66,00,000 |
| J | Tax savings/ (expenditure) | ₹14,00,000 | ₹(5,50,000) | ₹(60,00,000) | ₹ (33,00,000) |
| K | Profit After Tax | ₹ (14,00,000) | ₹5,50,000 | ₹60,00,000 | ₹33,00,000 |
| L | Add: Depreciation (F+G) | ₹30,00,000 | ₹30,00,000 | ₹34,00,000 | ₹34,00,000 |
| M | Cash Flow After Tax | ₹16,00,000 | ₹35,50,000 | ₹94,00,000 | ₹67,00,000 |

**Calculation of NPV**

| Year | Particula | Cash Flows | PV factor | PV |
|---|---|---|---|---|
| 0 | Initial Investment | ₹ (2,40,00,000) | 1.000 | ₹ (2,40,00,000) |
| 0 | Working Capital Introduced | ₹ (25,00,000) | 1.000 | ₹ (25,00,000) |
| 1 | CFAT | ₹16,00,000 | 0.893 | ₹ 14,28,800 |
| 2 | CFAT | ₹ 35,50,000 | 0.797 | ₹ 28,29,350 |
| 2 | Additional Equipment | ₹ (26,00,000) | 0.797 | ₹ (20,72,200) |
| 3 | CFAT | ₹ 94,00,000 | 0.712 | ₹ 66,92,800 |
| 4 | CFAT | ₹ 94,00,000 | 0.636 | ₹ 59,78,400 |
| 5 | CFAT | ₹ 94,00,000 | 0.567 | ₹ 53,29,800 |

| | | | | |
|---|---|---|---|---|
| 6 | CFAT | ₹ 67,00,000 | 0.507 | ₹ 33,96,900 |
| 7 | CFAT | ₹ 67,00,000 | 0.452 | ₹ 30,28,400 |
| 8 | CFAT | ₹ 67,00,000 | 0.404 | ₹ 27,06,800 |
| 8 | WC Released | ₹ 25,00,000 | 0.404 | ₹ 10,10,000 |
| 8 | Salvage Value | ₹ 2,00,000 | 0.404 | ₹ 80,800 |
| | Net Present Value | | | **₹39,09,850** |

**Since the NPV is positive, the proposed project should be implemented.**

**Q.3** NPV Method (Accept/Not) | MTP Dec 21(2)

Superb Ltd. constructs customized parts for satellites to be launched by USA and Canada. The parts are constructed in eight locations (including the central headquarter) around the world. The Finance Director, Ms. Kuthrapali, chooses to implement video conferencing to speed up the budget process and save travel costs. She finds that, in earlier years, the company sent two officers from each location to the central headquarter to discuss the budget twice a year. The average travel cost per person, including air fare, hotels and meals, is ₹ 27,000 per trip. The cost of using video conferencing is ₹ 8,25,000 to set up a system at each location plus ₹ 300 per hour average cost of telephone time to transmit signals. A total 48 hours of transmission time will be needed to complete the budget each year. The company depreciates this type of equipment over five years by using straight line method. An alternative approach is to travel to local rented video conferencing facilities, which can be rented for ₹ 1,500 per hour plus ₹ 400 per hour averge cost for telephone charges. You are Senior Officer of Finance Department. You have been asked by Ms. Kuthrapali to EVALUATE the proposal and SUGGEST if it would be worthwhile for the company to implement video conferencing.

**Ans.**

**Option I : Cost of travel, in case Video Conferencing facility is not provided**
Total Trip = No. of Locations × No. of Persons × No. of Trips per Person = 7×2×2 = 28 Trips
Total Travel Cost (including air fare, hotel accommodation and meals) (28 trips × ₹ 27,000 per trip) = **₹ 7,56,000**

**Option II : Video Conf.Facility is provided by Installation of Own Equipment at Different Locations**
Cost of Equipment at each location (₹ 8,25,000 × 8 locations) = ₹ 66,00,000
Economic life of Machines (5 years). Annual depreciation (66,00,000/5) = ₹ 13,20,000
Annual transmission cost (48 hrs. transmission × 8 locations × ₹ 300 per hour) = ₹ 1,15,200
Annual cost of operation (13,20,000 + 1,15,200) = ₹ 14,35,200
**Option III : Engaging Video Conferencing Facility on Rental Basis**
Rental cost (48 hrs. × 8 location × ₹ 1,500 per hr) = ₹ 5,76,000
Telephone cost (48 hrs.× 8 locations × ₹ 400 per hr.) = ₹ 1,53,600
Total rental cost of equipment (5,76,000 + 1,53,600) = ₹ 7,29,600
**Analysis:** The annual cash outflow is minimum, if video conferencing facility is engaged on rental basis Therefore, Option III is suggested.

**Q.4** NPV Method (Accept/Not) | MTP May 19(2)

(a) Prem Ltd has a maximum of Rs. 8,00,000 available to invest in new projects. Three possibilities have emerged and the business finance manager has calculated Net present Value (NPVs) for each of the projects as follows:

| Investment | Initial cash outlay Rs. | NPV Rs. |
|---|---|---|
| Alfa (α) | 5,40,000 | 1,00,000 |
| Beta(β) | 6,00,000 | 1,50,000 |
| Gama (γ) | 2,60,000 | 58,000 |

DETERMINE which investment/combination of investments should the company invest in, if we assume that the projects can be divided?

(b) Invest Corporation Ltd. adjusts risk through discount rates by adding various risk premiums to the risk free rate. Depending on the resultant rate, the proposed project is judged to be a low, medium or high risk project.

| Risk level | Risk free rate (%) | Risk Premium (%) |
|---|---|---|
| Low | 8 | 4 |
| Medium | 8 | 7 |
| High | 8 | 10 |

DEMONSTRATE the acceptability of the project on the basis of Risk Adjusted rate

**Ans.**

**(a)** Since funds available are restricted, the normal Net Present Value (NPV) rule of accepting investments decisions with the highest NPVs cannot be adopted straight way. Further, as the projects are divisible, a Profitability Index (PI) can be utilized to provide the most beneficial combination of investment for Rio Ltd.

| Project | PV Per Rs. | Rank as per PI |
|---|---|---|
| Alfa (α) | Rs. 6,40,000 / Rs. 5,40,000 = 1.185 | III |
| Beta (β) | Rs. 7,50,000 / Rs. 6,00,000 = 1.250 | I |
| Gama (γ) | Rs. 3,18,000 / Rs. 2,60,000 = 1.223 | II |

Therefore Rio Ltd should invest Rs. 6,00,000 into project β (Rank I) earnings Rs. 1,50,000 and Rs.2,00,000 into project γ (Rank II) earning Rs.44,615 Rs. 2,00,000 / Rs. 2,60,000 × Rs. 58,000
So, total NPV will be Rs.1,94,615 Rs. 1,50,000 + Rs. 44,615 from Rs. 8,00,000 of investment.

**(b) Calculation of Risk Adjusted rate**

| Risk level | Risk free rate (%) | Risk Premium (%) | Risk adjusted rate (%) |
|---|---|---|---|
| Low | 8 | 4 | 12 |
| Medium | 8 | 7 | 15 |
| High | 8 | 10 | 18 |

The cash flows of the project considered are as following:

| Point in time (yearly intervals) | 0 | 1 | 2 |
|---|---|---|---|
| Cash flow (Rs. in crore) | (100) | 45 | 80 |

**If the project is judged to be Low risk**

| Years | 0 | 1 | 2 |
|---|---|---|---|
| PV (Rs. in crore) | (100) | $\frac{45}{1+0.12} = 40.18$ | $\frac{80}{(1+0.12)^2} = 63.78$ |

NPV = 40.18 + 63.78 – 100 = 3.96: Accept

**If the project is judged to be Medium risk**

| Years | 0 | 1 | 2 |
|---|---|---|---|
| PV (Rs. in crore) | (100) | $\frac{45}{1+0.15} = 39.13$ | $\frac{80}{(1+0.15)^2} = 60.49$ |

NPV = 39.13 + 60.49 – 100 = (0.38): Reject

| Years | 0 | 1 | 2 |
|---|---|---|---|
| PV (Rs. in crore) | (100) | $\frac{45}{1+0.18} = 38.14$ | $\frac{80}{(1+0.18)^2} = 57.45$ |

NPV = 38.14 + 57.45 – 100 = (4.41): Reject

**Q.5** | Adjusted PV & Disc Rate | PY May 18

(a) XYZ Ltd. is presently all equity financed. The directors of the company have been evaluating investment in a project which will require ₹ 270 lakhs capital expenditure on new machinery. They expect the capital investment to provide annual cash flows of ₹ 42 lakhs indefinitely which is net of all tax adjustments. The discount rate which it applies to such investment decisions is 14% net.

The directors of the company believe that the current capital structure fails to take advantage of tax benefits of debt, and propose to finance the new project with undated perpetual debt secured on the company's assets. The company intends to issue sufficient debt to cover the cost of capital expenditure and the after tax cost of issue.

The current annual gross rate of interest required by the market on corporate undated debt of similar risk is 10%. The after tax costs of issue are expected to be ₹ 10 lakhs. Company's tax rate is 30%.

You are required to calculate:

(i) The adjusted present value of the investment,

(ii) The adjusted discount rate and

(iii) Explain the circumstances under which this adjusted discount rate may be used to evaluate future investments.

(b) What are Masala Bonds?

**Ans.**

**(a) (i) Calculation of Adjusted Present Value of Investment (APV)**

Adjusted PV = Base Case PV + PV of financing decisions associated with the project

Base Case NPV for the project:

| | |
|---|---|
| (-) ₹ 270 lakhs + (₹ 42 lakhs / 0.14) | = (-) ₹ 270 lakhs + ₹ 300 lakhs |
| | = ₹ 30 |
| Issue costs | = ₹ 10 lakhs |
| Thus, the amount to be raised | = ₹ 270 lakhs + ₹ 10 lakhs |
| | = ₹ 280 lakhs |
| Annual tax relief on interest payment | = ₹ 280 X 0.1 X 0.3 |
| | = ₹ 8.4 lakhs in perpetuity |
| The value of tax relief in perpetuity | = ₹ 8.4 lakhs / 0.1 |
| | = ₹ 84 lakhs |

Therefore, APV = Base case PV – Issue Costs + PV of Tax Relief on debt interest

= ₹ 30 lakhs – ₹ 10 lakhs + 84 lakhs = ₹ 104 lakhs

**(ii) Calculation of Adjusted Discount Rate (ADR)**

Annual Income / Savings required to allow an NPV to zero

Let the annual income be x.

| | |
|---|---|
| (-) ₹280 lakhs X (Annual Income / 0.14) | = (-) ₹104 lakhs |
| Annual Income / 0.14 | = (-) ₹ 104 + ₹ 280 lakhs |
| Therefore, Annual income | = ₹ 176 X 0.14 = ₹ 24.64 lakhs |
| Adjusted discount rate | = (₹ 24.64 lakhs / ₹280 lakhs) X 100 |
| | = 8.8% |

**(iii) Useable circumstances**

This ADR may be used to evaluate future investments only if the business risk of the new venture is identical to the one being evaluated here and the project is to be financed by the same method on the same terms. The effect on the company's cost of capital of introducing debt into the capital structure cannot be ignored.

**(b) Masala Bond:**

Masala (means spice) bond is an Indian name used for Rupee denominated bond that Indian corporate borrowers can sell to investors in overseas markets. These bonds are issued outside India but denominated in Indian Rupees. NTPC raised ₹2,000 crore via masala bonds for its capital expenditure in the year 2016.

**Q.6** Annualised Yeild | PY Dec 21

Stand Ltd. is contemplating replacement of one of its machines which has become outdated and inefficient. Its financial manager has prepared a report outlining two possible replacement machines. The details of each machine are as follows:

| | Machine 1 | Machine 2 |
|---|---|---|
| Initial investment | ₹ 12,00,000 | ₹ 16,00,000 |
| Estimated useful life | 3 years | 5 years |
| Residual value | ₹ 1,20,000 | ₹ 1,00,000 |
| Contribution per annum | ₹ 11,60,000 | ₹ 12,00,000 |
| Fixed maintenance costs per annum | ₹ 40,000 | ₹ 80,000 |
| Other fixed operating costs per annum | ₹ 7,20,000 | ₹ 6,10,000 |

The maintenance costs are payable annually in advance. All other cash flows apart from the initial investment assumed to occur at the end of each year. Depreciation has been calculated by straight line method and has been included in other fixed operating costs. The expected cost of capital for this project is assumed as 12% p.a

Required:

(i) Which machine is more beneficial, using Annualized Equivalent Approach? Ignore tax.

(ii) Calculate the sensitivity of your recommendation in part (i) to changes in the contribution generated by machine 1.

| *Year* | *1* | *2* | *3* | *4* | *5* | *6* |
|---|---|---|---|---|---|---|
| *PVIF0.12,t* | *0.893* | *0.797* | *0.712* | *0.636* | *0.567* | *0.507* |
| *PVIFA0.12,t* | *0.893* | *1.690* | *2.402* | *3.038* | *3.605* | *4.112* |

**Ans.**

**Calculation of Net Cash flows**

**Machine 1**

Other fixed operating costs (excluding depreciation) = 7,20,000-[(12,00,000-1,20,000)/3] = ₹ 3,60,000

| Year | Initial Investment (₹) | Contribution (₹) | Fixed maintenance costs(₹) | Other fixed operating costs (excluding depreciation) (₹) | Residual Value(₹) | Net cash flow(₹) |
|---|---|---|---|---|---|---|
| 0 | (12,00,000) | | (40,000) | | | (12,40,000) |
| 1 | | 11,60,000 | (40,000) | (3,60,000) | | 7,60,000 |
| 2 | | 11,60,000 | (40,000) | (3,60,000) | | 7,60,000 |
| 3 | | 11,60,000 | | (3,60,000) | 1,20,000 | 9,20,000 |

**Machine 2**

Other fixed operating costs (excluding depreciation) = 6,10,000-[(16,00,000-1,00,000)/5] = ₹ 3,10,000

| Year 0 | Initial Investment (₹) (16,00,000) | Contribution (₹) | Fixed maintenanc costs (₹) (80,000) | Other fixed operating costs (excluding depreciation) (₹) | Residual Value (₹) | Net cash flow (₹) (16,80,000) |
|---|---|---|---|---|---|---|
| 1 | | 12,00,000 | (80,000) | (3,10,000) | | 8,10,000 |
| 2 | | 12,00,000 | (80,000) | (3,10,000) | | 8,10,000 |
| 3 | | 12,00,000 | (80,000) | (3,10,000) | | 8,10,000 |
| 4 | | 12,00,000 | (80,000) | (3,10,000) | | 8,10,000 |
| 5 | | 12,00,000 | | (3,10,000) | 1,00,000 | 9,90,000 |

**Calculation of Net Present Value**

| | | Machine 1 | | Machine 2 | |
|---|---|---|---|---|---|
| Year | 12% discount factor | Net cash flow (₹) | Present value (₹) | Net cash flow (₹) | Present value (₹) |
| 0 | 1.000 | (12,40,000) | (12,40,000) | (16,80,000) | (16,80,000) |
| 1 | 0.893 | 7,60,000 | 6,78,680 | 8,10,000 | 7,23,330 |
| 2 | 0.797 | 7,60,000 | 6,05,720 | 8,10,000 | 6,45,570 |
| 3 | 0.712 | 9,20,000 | 6,55,040 | 8,10,000 | 5,76,720 |
| 4 | 0.636 | | | 8,10,000 | 5,15,160 |
| 5 | 0.567 | | | 9,90,000 | 5,61,330 |
| **NPV @ 12%** | | | **6,99,440** | | **13,42,110** |
| PVAF @ 12% | | | 2.402 | | 3.605 |
| **Equivalent Annualized Criterion** | | | **2,91,190.674** | | **3,72,291.262** |

**Recommendation: Machine 2 is more beneficial using Equivalent Annualized Criterion.**

**(ii) Calculation of sensitivity of recommendation in part (i) to changes in the contribution generated by machine 1**

Difference in Equivalent Annualized Criterion of Machines required for changing the recommendation in part (i) = 3,72,291.262- 2,91,190.674 = **₹ 81,100.588**

∴ Sensitivity relating to contribution $\frac{81.100.588}{11.60.000.00}$ = ×100 = 6.991 or **7% yearly**

**Alternatively,**

The annualized equivalent cash flow for machine 1 is lower by ₹ (3,72,291.262–2,91,190.674) = **₹81,100.588** than for machine 2. Therefore, it would need to increase contribution for **complete 3 years** before the decision would be to invest in this machine.

Sensitivity w.r.t contribution = 81,100.588 / (11,60,000 × 2.402) x100 = **2.911%**

**Q.7** NPV Method (Best Option) | PY Nov 22

A firm is in need of a small vehicle to make deliveries. It is intending to choose between two options. One option is to buy a new three wheeler that would cost ₹ 1,50,000 and will remain in service for 10 years.

The other alternative is to buy a second hand vehicle for ₹ 80,000 that could remain in service for 5 years. Thereafter the firm, can buy another second hand vehicle for ₹ 60,000 that will last for another 5 years.

The scrap value of the discarded vehicle will be equal to it written down value (WDV). The firm pays 30% tax and is allowed to claim depreciation on vehicles @ 25% on WDV basis.

The cost of capital of the firm is 12%.

You are required to advise the best option.

Given:

| *t* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |
|---|---|---|---|---|---|---|---|---|---|---|
| *PVIF (t,12%)* | *0.892* | *0.797* | *0.711* | *0.635* | *0.567* | *0.506* | *0.452* | *0.403* | *0.360* | *0.322* |

**Ans.** **Selection of Investment Decision**

| Tax shield on Purchase of New vehicle | | | |
|---|---|---|---|
| Year | WDV | Dep. @ 25% | Tax shield @ 30% |
| 1 | 1,50,000 | 37,500 | 11,250 |
| 2 | 1,12,500 | 28,125 | 8,437 |
| 3 | 84,375 | 21,094 | 6,328 |
| 4 | 63,281 | 15,820 | 4,746 |

| | | | |
|---|---|---|---|
| 5 | 47,461 | 11,865 | 3,560 |
| 6 | 35,596 | 8,899 | 2,670 |
| 7 | 26,697 | 6,674 | 2,002 |
| 8 | 20,023 | 5,006 | 1,502 |
| 9 | 15,017 | 3,754 | 1,126 |
| 10 | 11,263 | 2,816 | 845 |
| 11 | 8,447 | Scrap value | |

**Tax shield on Purchase of Second hand vehicles**

| Year | WDV | Dep. @ 25% | Tax shield @ 30% | |
|---|---|---|---|---|
| 1 | 80,000 | 20,000 | 6,000 | |
| 2 | 60,000 | 15,000 | 4,500 | |
| 3 | 45,000 | 11,250 | 3,375 | |
| 4 | 33,750 | 8,437 | 2,531 | |
| 5 | 25,313 | 6,328 | 1,898 | Scrap value = ₹ 18,985 |
| 6 | 60,000 | 15,000 | 4,500 | |
| 7 | 45,000 | 11,250 | 3,375 | |
| 8 | 33,750 | 8,437 | 2,531 | |
| 9 | 25,313 | 6,328 | 1,898 | Scrap value = ₹ 14,239 |
| 10 | 18,985 | 4,746 | 1,424 | |

**Calculation of PV of Net outflow of New Vehicle**

| Year | Cash OF/IF | PV Factor | PV of OF/IF |
|---|---|---|---|
| 0 | 1,50,000 | 1 | 1,50,000 |
| 1 | (11,250) | 0.892 | (10,035) |
| 2 | (8,437) | 0.797 | (6,724) |
| 3 | (6,328) | 0.711 | (4,499) |
| 4 | (4,746) | 0.635 | (3,014) |
| 5 | (3,560) | 0.567 | (2,018) |
| 6 | (2,670) | 0.506 | (1,351) |
| 7 | (2,002) | 0.452 | (905) |
| 8 | (1,502) | 0.403 | (605) |
| 9 | (1,126) | 0.360 | (405) |
| 10 | (845 + 8447) | 0.322 | (2,992) |
| | | **PVNOF** | **1,17,452** |

**Calculation of PV of Net outflow of Second hand Vehicles**

| Year | Cash OF/IF | PV Factor | PV of OF/IF |
|---|---|---|---|
| 0 | 80,000 | 1 | 80,000 |
| 1 | (6,000) | 0.892 | (5,352) |
| 2 | (4,500) | 0.797 | (3,587) |
| 3 | (3,375) | 0.711 | (2,400) |
| 4 | (2,531) | 0.635 | (1,607) |

| | | | |
|---|---|---|---|
| 5 | (60000 – 18985 – 1898) = 39,117 | 0.567 | 22,179 |
| 6 | (4,500) | 0.506 | (2,277) |
| 7 | (3,375) | 0.452 | (1,525) |
| 8 | (2,531) | 0.403 | (1,020) |
| 9 | (1,898) | 0.360 | (683) |
| 10 | (1424 + 14239) = (15,663) | 0.322 | (5,043) |
| | | **PVNOF** | **78,686** |

**Advise:** The PV of net outflow is low in case of buying the second hand vehicles. Therefore, it is advisable to buy second hand vehicles.

**Q.8** NPV Method (Buy M/c or not) | PY Nov 22

A hospital is considering to purchase a diagnostic machine costing ₹ 80,000. The projected life of the machine is 8 years and has an expected salvage value of ₹ 6,000 at the end of 8 years. The annual operating cost of the machine is ₹ 7,500. It is expected to generate revenues of ₹ 40,000 per year for eight years. Presently, the hospital is outsourcing the diagnostic work and is earning commission income of ₹ 12,000 per annum.
Consider tax rate of 30% and Discounting Rate as 10%.
Advise:
Whether it would be profitable for the hospital to purchase the machine?
Give your recommendation as per Net Present Value method and Present Value Index method under below mentioned two situations:
(i) If Commission income of ₹ 12,000 p.a. is before taxes.
(ii) If Commission income of ₹ 12,000 p.a. is net of taxes
Given:

| *t* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* |
|---|---|---|---|---|---|---|---|---|
| *PVIF (t, 10%)* | *0.909* | *0.826* | *0.751* | *0.683* | *0.621* | *0.564* | *0.513* | *0.467* |

**Ans.**

**Analysis of Investment Decisions**

| **Determination of Cash inflows** | **Situation-(i) Commission Income before taxes** | **Situation-(ii) Commission Income after taxes** |
|---|---|---|
| *Cash flow up-to 7th year:* | | |
| Sales Revenue | 40,000 | 40,000 |
| *Less:* Operating Cost | (7,500) | (7,500) |
| | 32,500 | 32,500 |
| *Less:* Depreciation (80,000 – 6,000) ÷ 8 | (9,250) | (9,250) |
| Net Income | 23,250 | 23,250 |
| Tax @ 30% | (6,975) | (6,975) |
| Earnings after Tax (EAT) | 16,275 | 16,275 |
| *Add:* Depreciation | 9,250 | 9,250 |
| Cash inflow after tax per annum | 25,525 | 25,525 |
| *Less:* Loss of Commission Income | (8,400) | (12,000) |
| Net Cash inflow after tax per annum | 17,125 | 13,525 |
| *In 8th Year:* | | |

| | | |
|---|---|---|
| Net Cash inflow after tax | | |
| *Add:* Salvage Value of Machine | 6,000 | 6,000 |
| **Net Cash inflow in year 8** | **23,125** | **19,525** |

**Calculation of Net Present Value (NPV) and Profitability Index (PI)**

| | Particulars | PV factor @10% | Situation-(i) [Commission Income before taxes] | Situation-(ii) [Commission Income after taxes] |
|---|---|---|---|---|
| A | Present value of cash inflows (1st to 7th year) | 4.867 | 83,347.38 (17,125 × 4.867) | 65,826.18 (13,525 × 4.867) |
| B | Present value of cash inflow at 8th year | 0.467 | 10,799.38 (23,125 × 0.467) | 9,118.18 (19,525 × 0.467) |
| C | PV of cash inflows | | 94,146.76 | 74,944.36 |
| D | *Less:* Cash Outflow | 1.00 | (80,000) | (80,000) |
| E | **Net Present Value (NPV)** | | **14,146.76** | **(5,055.64)** |
| F | **PI = (C÷D)** | | **1.18** | **0.94** |

**Recommendation:** The hospital may consider purchasing of diagnostic machine in situation (i) where commission income is 12,000 before tax as NPV is positive and PI is also greater than 1. Contrary to situation (i), in situation (ii) where the commission income is net of tax, the recommendation is reversed to not purchase the machine as NPV is negative and PI is also less than 1.

**Q.9** Buy New Machine | RTP July 21

The General Manager of Merry Ltd. is considering the replacement of five -year-old equipment. The company has to incur excessive maintenance cost of the equipment. The equipment has zero written down value. It can be modernized at a cost of ₹ 1,40,000 enhancing its economic life to 5 years. The equipment could be sold for ₹ 30,000 after 5 years. The modernization would help in material handling and in reducing labour , maintenance & repairs costs.

The company has another alternative to buy a new machine at a cost of ₹ 3,50,000 with an economic life of 5 years and salvage value of ₹ 60,000. The new machine is expected to be more efficient in reducing costs of material handling, labour , maintenance & repairs, etc.

The annual cost are as follows:

| | Existing Equipment (₹) | Modernization (₹) | New Machine (₹) |
|---|---|---|---|
| Wages & Salaries | 45,000 | 35,500 | 15,000 |
| Supervision | 20,000 | 10,000 | 7,000 |
| Maintenance | 25,000 | 5,000 | 2,500 |
| Power | 30,000 | 20,000 | 15,000 |
| | 1,20,000 | 70,500 | 39,500 |

Assuming tax rate of 50% and required rate of return of 10%, should the company modernize the equipment or buy a new machine? PV factor at 10% are as follows:

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| PV factor | 0.909 | 0.826 | 0.751 | 0.683 | 0.621 |

**Ans.**

**Workings:**

**Calculation of Depreciation:**

On Modernized Equipment = $\frac{140000 - 30000}{5 \text{ years}}$ = ₹ 22,000 p.a.

On New machine = $\frac{350000 - 60000}{5 \text{ years}}$ = ₹ 58,000 p.a.

**(i) Calculation of Incremental annual cash inflows/ savings:**

| Particulars | Existing Equipment (₹) | Modernization | | New Machine | |
|---|---|---|---|---|---|
| | | Amount (₹) | Savings (₹) | Amount (₹) | Savings (₹) |
| | (1) | (2) | (3)=(1)-(2) | (4) | (5)=(1)-(4) |
| Wages & Salaries | 45,000 | 35,500 | 9,500 | 15,000 | 30,000 |
| Supervision | 20,000 | 10,000 | 10,000 | 7,000 | 13,000 |
| Maintenance | 25,000 | 5,000 | 20,000 | 2,500 | 22,500 |
| Power | 30,000 | 20,000 | 10,000 | 15,000 | 15,000 |
| **Total** | **1,20,000** | **70,500** | **49,500** | **39,500** | **80,500** |
| *Less:* Depreciation (Refer Workings) | | | 22,000 | | 58,000 |
| **Total Savings** | | | **27,500** | | **22,500** |
| *Less*: Tax @ 50% | | | 13,750 | | 11,250 |
| **After Tax Savings** | | | **13,750** | | **11,250** |
| *Add*: Depreciation | | | 22,000 | | 58,000 |
| **Incremental Annual Cash Inflows** | | | **35,750** | | **69,250** |

**(ii) Calculation of Net Present Value (NPV)**

| Particulars | Year | Modernization (₹) | New Machine (₹) |
|---|---|---|---|
| Initial Cash outflow (A) | 0 | 1,40,000.00 | 3,50,000.00 |
| Incremental Cash Inflows | 1-5 | 1,35,492.50 (₹ 35,750 x 3.790) | 2,62,457.50 (₹ 69,250 x 3.790) |
| Salvage value | 5 | 18,630.00 (₹ 30,000 x 0.621) | 37,260.00 (₹ 60,000 x 0.621) |
| PV of Cash inflows (B) | | 1,54,122.50 | 2,99,717.50 |
| Net Present Value (B - A) | | 14,122.50 | (50,282.50) |

**Advise:** The company should modernize its existing equipment and not buy a new machine because NPV is positive in modernization of equipment.

**Q.10** Buy New Machine | RTP Nov 20

A large profit making company is considering the installation of a machine to process the waste produced by one of its existing manufacturing process to be converted into a marketable product. At present, the waste is removed by a contractor for disposal on payment by the company of ₹ 150 lakh per annum for the next four years. The contract can be terminated upon installation of the aforesaid machine on payment of a compensation of ₹ 90 lakh before the processing operation starts. This compensation is not allowed as deduction for tax purposes.
The machine required for carrying out the processing will cost ₹ 600 lakh to be financed by a loan repayable in 4 equal instalments commencing from end of the year 1. The interest rate is 14% per annum. At the end of the 4th year, the machine can be sold for ₹ 60 lakh and the cost of dismantling and removal will be ₹ 45 lakh.
Sales and direct costs of the product emerging from waste processing for 4 years are estimated as under:

(₹ In lakh)

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Sales | 966 | 966 | 1,254 | 1,254 |
| Material consumption | 90 | 120 | 255 | 255 |
| Wages | 225 | 225 | 255 | 300 |
| Other expenses | 120 | 135 | 162 | 210 |
| Factory overheads | 165 | 180 | 330 | 435 |
| Depreciation (as per income tax rules) | 150 | 114 | 84 | 63 |

Initial stock of materials required before commencement of the processing operations is ₹60 lakh at the start of year 1. The stock levels of materials to be maintained at the end of year 1, 2 and 3 will be ₹ 165 lakh and the stocks at the end of year 4 will be nil. The storage of materials will utilise space which would otherwise have been rented out for ₹ 30 lakh per annum. Labour costs include wages of 40 workers, whose transfer to this process will reduce idle time payments of ₹ 45 lakh in the year - 1 and ₹ 30 lakh in the year - 2. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of ₹ 90 lakh per annum payable on this venture. The company's tax rate is 30%.

**Present value factors for four years are as under:**

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| PV factors @14% | 0.877 | 0.769 | 0.674 | 0.592 |

ADVISE the management on the desirability of installing the machine for processing the waste. All calculations should form part of the answer.

**Ans.**

**Statement of Operating Profit from processing of waste** (₹ in lakh)

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Sales :(A) | 966 | 966 | 1,254 | 1,254 |
| Material consumption | 90 | 120 | 255 | 255 |
| Wages | 180 | 195 | 255 | 300 |
| Other expenses | 120 | 135 | 162 | 210 |
| Factory overheads (insurance only) | 90 | 90 | 90 | 90 |
| Loss of rent on storage space (opportunity cost) | 30 | 30 | 30 | 30 |
| Interest @14% | 84 | 63 | 42 | 21 |
| Depreciation (as per income tax rules) | 150 | 114 | 84 | 63 |
| Total cost: (B) | 744 | 747 | 918 | 969 |
| Profit (C)=(A)-(B) | 222 | 219 | 336 | 285 |
| Tax (30%) | 66.6 | 65.7 | 100.8 | 85.5 |
| Profit after Tax (PAT) | 155.4 | 153.3 | 235.2 | 199.5 |

**Statement of Incremental Cash Flows** (₹ in lakh)

| Year | | | | | |
|---|---|---|---|---|---|
| Material stock | (60) | (105) | - | - | 165 |
| Compensation for contract | (90) | - | - | - | - |
| Contract payment saved | - | 150 | 150 | 150 | 150 |
| Tax on contract payment | - | (45) | (45) | (45) | (45) |
| Incremental profit | - | 222 | 219 | 336 | 285 |

| | | | | | |
|---|---|---|---|---|---|
| Depreciation added back | - | 150 | 114 | 84 | 63 |
| Tax on profits | - | (66.6) | (65.7) | (100.8) | (85.5) |
| Loan repayment | - | (150) | (150) | (150) | (150) |
| Profit on sale of machinery (net) | - | - | - | - | 15 |
| Total incremental cash flows | (150) | 155.4 | 222.3 | 274.2 | 397.5 |
| Present value factor | 1.00 | 0.877 | 0.769 | 0.674 | 0.592 |
| Present value of cash flows | (150) | 136.28 | 170.95 | 184.81 | 235.32 |
| Net present value | | | | | 577.36 |

Advice: Since the net present value of cash flows is ₹ 577.36 lakh which is positive the management should install the machine for processing the waste.

Notes:

(i) Material stock increases are taken in cash flows.
(ii) Idle time wages have also been considered.
(iii) Apportioned factory overheads are not relevant only insurance charges of this project are relevant.
(iv) Interest calculated at 14% based on 4 equal instalments of loan repayment.
(v) Sale of machinery- Net income after deducting removal expenses taken. Tax on Capital gains ignored.
(vi) Saving in contract payment and income tax thereon considered in the cash flows.

**Q.11** Buy or Rent | PY May 18

Maruti Ltd. requires a plant costing ₹ 200 Lakhs for a period of 5 years. The company can use the plant for the stipulated period through leasing arrangement or the requisite amount can be borrowed to buy the plant. In case of leasing, the company received a proposal to pay annual lease rent of ₹ 48 Lakhs at the end of each year for a period of 5 years.

In case of purchase, the company would have a 12%, 5 years loan to be paid in equated annual installment, each installment becoming due in the beginning of each year. It is estimated that plant can be sold for ₹ 40 Lakhs at the end of 5th year. The company uses straight line method of depreciation. Corporate tax rate is 30 %. Cost of Capital after tax for the company is 10%.

The PVIF @ 10% and 12% for the five years are given below:

| *Year* | *1* | *2* | *3* | *4* | *5* |
|---|---|---|---|---|---|
| *PVIF @ 10* | *0.909* | *0.826* | *0.751* | *0.683* | *0.621* |
| *PVIF @ 12* | *0.893* | *0.797* | *0.712* | *0.636* | *0.567* |

You are required to advise whether the plant should be purchased or taken on lease.

**Ans.**

**Purchase Option**

Loan installment = ₹ 200 lakhs / (1 + PVIFA 12%, 4)
= ₹ 200 lakhs / (1 + 3.038) = ₹ 49.53 lakhs

Interest payable = (₹ 49.53 X 5) – ₹ 200 lakhs = ₹ 47.65 lakhs

**Working note:**

**Amortisation of Loan Installment**

| Year | Loan amount (₹ In Lakhs) | Installment (₹In Lakhs) | Interet (₹ In Lakhs) | Principal (₹ In Lakhs) | O/S Amount (₹ In Lakhs) |
|---|---|---|---|---|---|
| 0 | 200 | 49.53 | 0.00 | 49.53 | 150.47 |
| 1 | 150.47 | 49.53 | 18.06 | 31.47 | 119.00 |
| 2 | 119.00 | 49.53 | 14.28 | 35.25 | 83.75 |
| 3 | 83.75 | 49.53 | 10.05 | 39.48 | 44.27 |
| 4 | 44.27 | 49.53 | *5.26 | 44.27 | - |

| | | | | | |
|---|---|---|---|---|---|
| 5 | 0 | 0 | 0 | 0 | 0 |

**Calculation of PV of outflow under Purchase Option**

(₹ In Lakhs)

| (1) End | (2) Debt Payment | (3) Int. of the o/s Principal | (4) Dep. | (5) Tax Shield [(3) +(4)]x 0.3 | (6) Net Cash out flows (2) – (5) | (7) PV factors @ 10% | (8) PV |
|---|---|---|---|---|---|---|---|
| 0 | 49.53 | 0.00 | 0.00 | 0.00 | 49.53 | 1.000 | 49.53 |
| 1 | 49.53 | 18.06 | 32.00 | 15.02 | 34.51 | 0.909 | 31.37 |
| 2 | 49.53 | 14.28 | 32.00 | 13.88 | 35.65 | 0.826 | 29.44 |
| 3 | 49.53 | 10.05 | 32.00 | 12.61 | 36.92 | 0.751 | 27.72 |
| 4 | 49.53 | *5.26 | 32.00 | 11.18 | 38.35 | 0.683 | 26.19 |
| 5 | 49.53 | 0 | 32.00 | 9.60 | (9.60) | 0.621 | (5.96) |
| | | 47.65 | 160.00 | | | | 158.29 |
| | | | | | | *Less:* PV of Salvage Value (₹40 lakhs x 0.621) = | 24.84 |
| | | | | | | Total PV of Outflow | 133.45 |

*Balancing Figure

Leasing Option

PV of Outflows under lease @ 10% = ₹ 48 lakhs x (1-0.30) x 3.790
= ₹ 127.34 lakhs

Decision: The plant should be taken on lease because the PV of outflows is less as compared to purchase option.

**Q.12** Calculate IRR | MTP Nov 23(2)

A company proposes to install a machine involving a Capital Cost of ₹72,00,000. The life of the machine is 5 years and its salvage value at the end of the life is nil. The machine will produce the net operating income after depreciation of ₹13,60,000 per annum. The Company's tax rate is 35%.

The Net Present Value factors for 5 years are as under:

| Discounting Rate | : | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|
| Cumulative factor | : | 3.43 | 3.35 | 3.27 | 3.20 | 3.13 | 3.06 |

You are required to COMPUTE the internal rate of return (IRR) of the proposal.

**Ans.**

| Computation of cash inflow per annum | ₹ |
|---|---|
| Net operating income per annum | 13,60,000 |
| Less: Tax @ 35% | 4,76,000 |
| Profit after tax | 8,84,000 |
| Add: Depreciation (₹72,00,000 / 5 years) | 14,40,000 |
| Cash inflow | 23,24,000 |

The IRR of the investment can be found as follows:

NPV = – ₹ 72,00,000 + ₹ 23,24,000 (PVAF5, r) = 0

or PVA F5 r ( Cumulative factor) = $\frac{7200000}{2324000}$ = 3.09

**Computation of Internal Rate of Return (IRR)**

| | | |
|---|---|---|
| Discounting rate | 15% | 19% |
| Cumulative factor | 3.35 | 3.06 |
| Total NPV (₹) | 77,85,400 (₹23,24,000 × 3.35) | 71,11,440 (₹23,24,000 × 3.06) |
| Internal outlay (₹) | 72,00,000 | 72,00,000 |
| Surplus (Deficit) (₹) | 5,85,400 | (88,560) |

$$\text{IRR} = \text{LR} + \frac{\text{NPV at LR}}{\text{NPV at LR-NPV at HR}} \times (\text{HR - LR})$$

$$= 15\% + \frac{585400}{585400 - (-88560)} \times (19\% - 15\%)$$

$$= 15\% + 3.47 = 18.47\%$$

**Note:** Lower rate can be 18% or less than 18%. However, there will be no change in the final answer.

**Q.13** Calculate NPV | PY Nov 18

From the following details relating to a project, analyse the sensitivity of the project to changes in the Initial Project Cost, Annual Cash Inflow and Cost of Capital :

| Particulars | |
|---|---|
| Initial Project Cost | ₹2,00,00,000 |
| Annual Cash Inflow | ₹60,00,000 |
| Project Life | 5 years |
| Cost of Capital | 10% |

To which of the 3 factors, the project is most sensitive if the variable is adversely affected by 10 ?
Cumulative Present Value Factor for 5 years for 10% is 3.791 and for 11% is 3.696.

**Ans.**

**Calculation of NPV through Sensitivity Analysis**

| | ₹ |
|---|---|
| PV of cash inflows (₹ 60,00,000 × 3.791) | 2,27,46,000 |
| Initial Project Cost | 2,00,00,000 |
| NPV | 27,46,000 |

| Situation | NPV | Changes in NPV |
|---|---|---|
| Base(present) | ₹ 27,46,000 | |
| If initial project cost is varied adversely by 10% | (₹ 2,27,46,000 - ₹ 2,20,00,000*) = ₹ 746000 | $\frac{(2746000 - 746000)}{2746000}$ =(72.83%) |
| If annual cash inflow is varied adversely by 10% | [₹ 54,00,000(revised cash flow) ** × 3.791) - (₹ 2,00,00,000)] = ₹ 4,71,400 | $\frac{(2746000 - 471400)}{2746000}$ = 82.83% |
| If cost of capital is varied adversely by 10% i.e. it becomes 11% | (₹ 60,00,000 × 3.696)- ₹ 2,00,00,000 = ₹ 21,76,000 | $\frac{(2746000 - 2176400)}{2746000}$ = 20.76% |

*Revised initial project Cost = 2,00,00,000 × 110% = 2,20,00,000
**Revised Cash Flow = ₹ 60,00,000 x (100 – 10) % = ₹ 54,00,000
**Conclusion:** Project is most sensitive to 'annual cash inflow'

**Q.14** Calculate NPV | PY May 18

A company is evaluating a project that requires initial investment of ₹ 60 lakhs in fixed assets and ₹ 12 lakhs towards additional working capital.
The project is expected to increase annual real cash inflow before taxes by ₹ 24,00,000 during its life. The fixed assets would have zero residual value at the end of life of 5 years. The company follows straight line method of depreciation which is expected for tax purposes also. Inflation is expected to be 6% per year. For evaluating similar projects, the company uses discounting rate of 12% in real terms. Company's tax rate is 30%.
**Advise whether the company should accept the project, by calculating NPV in real terms.**

| | *PVIF (12%, 5 years)* | | *PVIF (12%, 5 years)* |
|---|---|---|---|
| *Year 1* | *0.893* | *Year 1* | *0.943* |
| *Year 2* | *0.797* | *Year 2* | *0.890* |
| *Year 3* | *0.712* | *Year 3* | *0.840* |
| *Year 4* | *0.636* | *Year 4* | *0.792* |
| *Year 5* | *0.567* | *Year 5* | *0.747* |

**Ans.**

(i) Equipment's initial cost = ₹ 60,00,000 + ₹ 12,00,000
= ₹ 72,00,000

(ii) Annual straight line depreciation = ₹ 60,00,000/5
= ₹ 12,00,000.

(iii) Net Annual cash flows can be calculated as follows:
= Before Tax CFs × (1 – Tc) + Tc × Depreciation (Tc = Corporate tax i.e. 30%)
= ₹ 24,00,000 × (1 – 0.3) + (0.3 x ₹ 12,00,000)
= ₹ 16,80,000 + ₹ 3,60,000 = ₹ 20,40,000

So, Total Present Value = PV of inflow + PV of working capital released
= (₹ 20,40,000 × PVIF 12%, 5 years) + (₹ 12,00,000 × 0.567)
= (₹ 20,40,000 × 3.605) + ₹ 6,80,400
= ₹ 73,54,200 + ₹ 6,80,400
= ₹ 80,34,600

So NPV = PV of Inflows – Initial Cost
= ₹ 80,34,600 – ₹ 72,00,000
= ₹ 8,34,600

Advice: Company should accept the project as the NPV is Positive

**Q.15** Equivalent Method | MTP Nov 23(1)

A new project "Ambar" requires an initial outlay of ₹ 4,50,000. The company uses certainty equivalent method approach to evaluate the project. The risk-free rate is 7%. Following information is available:

| Year | Cash Flow After Tax (₹) | Certainty Equivalent Coefficient |
|---|---|---|
| 1 | 1,50,000 | 0.90 |
| 2 | 2,25,000 | 0.80 |
| 3 | 1,75,000 | 0.58 |
| 4 | 1,50,000 | 0.56 |
| 5 | 70,000 | 0.50 |

PV Factor at 7%

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| PV Factor | 0.935 | 0.873 | 0.816 | 0.763 | 0.713 |

Is investment in the project beneficial based on above information?

**Ans.**

**Calculation of Net Present Value of the Project**

| Year | Cash Inflows After Tax (in₹) | C.E. | Adjusted Cash Inflows (in ₹) | Present Value Factor | Present Value (in ₹) |
|---|---|---|---|---|---|
| 1 | 1,50,000 | 0.90 | 1,35,000 | 0.935 | 1,26,225 |
| 2 | 2,25,000 | 0.80 | 1,80,000 | 0.873 | 1,57,140 |
| 3 | 1,75,000 | 0.58 | 1,01,500 | 0.816 | 82,824 |
| 4 | 1,50,000 | 0.56 | 84,000 | 0.763 | 64,092 |
| 5 | 70,000 | 0.50 | 35,000 | 0.713 | 24,955 |
| Total Present Value of Cash Inflows | | | | | **4,55,236** |
| Less: Initial Investment or Cash Outflow required for "Ambar" | | | | | (4,50,000) |
| Net Present Value | | | | | **5,236** |

**Conclusion:** As the Net Present Value of the project after considering the Certainty Equivalent factors is still positive, it may be advised to invest in project "Ambar".

**Q.16** NPV Method (Invest Appraisal) | RTP Nov 23

PQR Limited is considering buying a new machine which would have a useful economic life of five years, at a cost of ₹ 40,00,000 and a scrap value of ₹ 5,00,000, with 80 per cent of the cost being payable at the start of the project and 20 per cent at the end of the first year. The machine would produce 80,000 units per annum of a new product with an estimated selling price of ₹ 400 per unit. Direct costs would be ₹ 375 per unit and annual fixed costs, including depreciation calculated on a straight- line basis, would be ₹ 10,40,000 per annum.
In the first year and the second year, special sales promotion expenditure, not included in the above costs, would be incurred, amounting to ₹ 1,25,000 and ₹ 1,75,000 respectively.
EVALUATE the project using the NPV method of investment appraisal, assuming the company's cost of capital to be 12 percent.

**Ans.**

Calculation of Net Cash flows
Contribution = (400 – 375) × 80,000 = ₹ 20,00,000
Fixed costs = 10,40,000 – [(40,00,000 – 5,00,000)/5] = ₹ 3,40,000

| Year | Capital (₹) | Contribution (₹) | Fixed costs (₹) | Promotion (₹) | Net cash flow (₹) |
|---|---|---|---|---|---|
| 0 | (32,00,000) | | | | (32,00,000) |
| 1 | (8,00,000) | 20,00,000 | (3,40,000) | (1,25,000) | 7,35,000 |
| 2 | | 20,00,000 | (3,40,000) | (1,75,000) | 14,85,000 |
| 3 | | 20,00,000 | (3,40,000) | | 16,60,000 |
| 4 | | 20,00,000 | (3,40,000) | | 16,60,000 |
| 5 | 5,00,000 | 20,00,000 | (3,40,000) | | 21,60,000 |

**Calculation of Net Present Value**

| Year | Net cash flow | 12% discount factor | Present value (₹) |
|---|---|---|---|
| 0 | (32,00,000) | 1.000 | (32,00,000) |
| 1 | 7,35,000 | 0.893 | 6,56,355 |

| | | | |
|---|---|---|---|
| 2 | 14,85,000 | 0.797 | 11,83,545 |
| 3 | 16,60,000 | 0.712 | 11,81,920 |
| 4 | 16,60,000 | 0.636 | 10,55,760 |
| 5 | 21,60,000 | 0.567 | 12,24,720 |
| | | | **21,02,30** |

The net present value of the project is ₹21,02,300.

**Q.17** NPV Method (Invest Appraisal) RTP May 20

A company is considering the proposal of taking up a new project which requires an investment of ₹800 lakhs on machinery and other assets. The project is expected to yield the following earnings (before depreciation and taxes) over the next five years:

| Year | Earnings (₹ in lakhs) |
|---|---|
| 1 | 320 |
| 2 | 320 |
| 3 | 360 |
| 4 | 360 |
| 5 | 300 |

The cost of raising the additional capital is 12% and assets have to be depreciated at 20% on written down value basis. The scrap value at the end of the five year period may be taken as zero. Income-tax applicable to the company is 40%.

You are required to CALCULATE the net present value of the project and advise the management to take appropriate decision. Also CALCULATE the Internal Rate of Return of the Project.

Note: Present values of Re. 1 at different rates of interest are as follows

| Year | 10% | 12% | 14% | 16% | 20% |
|---|---|---|---|---|---|
| 1 | 0.91 | 0.89 | 0.88 | 0.86 | 0.83 |
| 2 | 0.83 | 0.80 | 0.77 | 0.74 | 0.69 |
| 3 | 0.75 | 0.71 | 0.67 | 0.64 | 0.58 |
| 4 | 0.68 | 0.64 | 0.59 | 0.55 | 0.48 |
| 5 | 0.62 | 0.57 | 0.52 | 0.48 | 0.40 |

**Ans.** **(i) Calculation of Net Cash Flow**

(₹ in lakhs)

| Year | Profit before dep. and tax | Depreciation (20% on WDV) | PBT | PAT | Net cash flow |
|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (3) + (5) |
| 1 | 320 | 800 × 20% = 160 | 160 | 96 | 256 |
| 2 | 320 | (800 – 160)× 20% = 128 | 192 | 115.20 | 243.20 |
| 3 | 360 | (640 – 128)× 20% = 102.4 | 257.6 | 154.56 | 256.96 |
| 4 | 360 | (512 – 102.4)× 20% = 81.92 | 278.08 | 166.85 | 248.77 |
| 5 | 300 | (409.6 – 81.92) = 327.68* | –27.68 | –16.61 | 311.07 |

*this is treated as a short term capital loss.

**(ii) Calculation of Net Present Value (NPV)** (₹ in lakhs)

| Year | Net Cash Flow | 12% | | 16% | | 20% | |
|---|---|---|---|---|---|---|---|
| | | D.F | P.V | D.F | P.V | D.F | P.V |
| 1 | 256 | 0.89 | 227.84 | 0.86 | 220.16 | 0.83 | 212.48 |
| 2 | 243.20 | 0.80 | 194.56 | 0.74 | 179.97 | 0.69 | 167.81 |
| 3 | 256.96 | 0.71 | 182.44 | 0.64 | 164.45 | 0.58 | 149.03 |
| 4 | 248.77 | 0.64 | 159.21 | 0.55 | 136.82 | 0.48 | 119.41 |
| 5 | 311.07 | 0.57 | 177.31 | 0.48 | 149.31 | 0.40 | 124.43 |
| | | | 941.36 | | 850.71 | | 773.16 |
| | Less: Initial Investment | | 800.00 | | 800.00 | | 800.00 |
| | | NPV | 141.36 | | 50.71 | | -26.84 |

**(iii) Advise:** Since Net Present Value of the project at 12% = 141.36 lakhs, therefore the project should be implemented.

**(iv) Calculation of Internal Rate of Return (IRR)**

$$IRR = 16\% + \frac{50.71 \times 4}{50.71 - (-26.84)}$$

$$= 16\% + \frac{2.03}{77.55} = 16\% + 2.62\% = 18.62\%.$$

**Q.18** NPV Method (Invest Appraisal) | RTP Nov 19

MTR Limited is considering buying a new machine which would have a useful economic life of five years, at a cost of ₹25,00,000 and a scrap value of ₹3,00,000, with 80 per cent of the cost being payable at the start of the project and 20 per cent at the end of the first year. The machine would produce 75,000 units per annum of a new product with an estimated sellingpriceof ₹300 per unit. Direct costs would be ₹285 per unit and annual fixed costs, including depreciation calculated on a straight- line basis, would be ₹8,40,000 per annum.

In the first year and the second year, special sales promotion expenditure, not included in the above costs, would be incurred, amounting to ₹1,00,000 and ₹1,50,000 respectively.

EVALUATE the project using the NPV method of investment appraisal, assuming the company's cost of capital to be 15 percent.

**Ans.**

**Calculation of Net Cash flows**

Contribution = (300 – 285) × 75,000 = ₹11,25,000

Fixed costs = 8,40,000 – [(25,00,000 – 3,00,000)/5] = ₹4,00,000

| Year | Capital (₹) | Contribution (₹) | Fixed costs (₹) | Adverts (₹) | Net cash flow (₹) |
|---|---|---|---|---|---|
| 0 | (20,00,000) | | | | (20,00,000) |
| 1 | (5,00,000) | 11,25,000 | (4,00,000) | (1,00,000) | 1,25,000 |
| 2 | | 11,25,000 | (4,00,000) | (1,50,000) | 5,75,000 |
| 3 | | 11,25,000 | (4,00,000) | | 7,25,000 |
| 4 | | 11,25,000 | (4,00,000) | | 7,25,000 |
| 5 | 3,00,000 | 11,25,000 | (4,00,000) | | 10,25,000 |

Calculationof Net Present Value

| Year | Net cash flow (₹) | 12% discount factor | Present value |
|---|---|---|---|
| 0 | (20,00,000) | 1.000 | (20,00,000) |
| 1 | 1,25,000 | 0.892 | 1,11,500 |

| | | | |
|---|---|---|---|
| 2 | 5,75,000 | 0.797 | 4,58,275 |
| 3 | 7,25,000 | 0.711 | 5,15,475 |
| 4 | 7,25,000 | 0.635 | 4,60,375 |
| 5 | 10,25,000 | 0.567 | 5,81,175 |
| | | | 1,26,800 |

The net present value of the project is ₹1,26,800.

**Q.19** NPV Method (Buy M/c or not) | RTP May 19

BT Pathology Lab Ltd. is using an X-ray machines which reached at the end of their useful lives. Following new X-ray machines are of two different brands with same features are available for the purchase.

| Brand | Cost of Machine | Life of Machine | Maintenance Cost | | | Rate of Depreciation |
|---|---|---|---|---|---|---|
| | | | Year 1-5 | Year 6-10 | Year 11-15 | |
| XYZ | ₹6,00,000 | 15 years | ₹ 20,000 | ₹ 28,000 | ₹ 39,000 | 4% |
| ABC | ₹4,50,000 | 10 years | ₹ 31,000 | ₹ 53,000 | -- | 6% |

Residual Value of both of above machines shall be dropped by 1/3 of Purchase price in the first year and thereafter shall be depreciated at the rate mentioned above.

Alternatively, the machine of Brand ABC can also be taken on rent to be returned back to the owner after use on the following terms and conditions:

- Annual Rent shall be paid in the beginning of each year and for first year it shall be ₹ 1,02,000.
- Annual Rent for the subsequent 4 years shall be ₹ 1,02,500.
- Annual Rent for the final 5 years shall be ₹ 1,09,950.
- The Rent Agreement can be terminated by BT Labs by making a payment of ₹ 1,00,000 as penalty. This penalty would be reduced by ₹ 10,000 each year of the period of rental agreement.

You are required to:

(a) ADVISE which brand of X-ray machine should be acquired assuming that the use of machine shall be continued for a period of 20 years.

(b) STATE which of the option is most economical if machine is likely to be used for a period of 5 years? The cost of capital of BT Labs is 12%.

**Ans.** Since the life span of each machine is different and time span exceeds the useful lives of each model, we shall use Equivalent Annual Cost method to decide which brand should be chosen.

**(i) If machine is used for 20 years**

**Present Value (PV) of cost if machine of Brand XYZ is purchased**

| Period | Cash Outflow(₹) | PVF@12% | Present Value |
|---|---|---|---|
| 0 | 6,00,000 | 1.000 | 6,00,000 |
| 1-5 | 20,000 | 3.605 | 72,100 |
| 6-10 | 28,000 | 2.045 | 57,260 |
| 11-15 | 39,000 | 1.161 | 45,279 |
| 15 | (64,000) | 0.183 | (11,712) |
| | | | 7,62,927 |

PVAF for 1-15 years 6.811

Equivalent Annual Cost $\frac{762927}{6811}$ = ₹ 1,12,014

Present Value (PV) of cost if machine of Brand ABC is purchased

| Period | Cash Outflow (₹) | PVF@12% | Present Value |
|---|---|---|---|
| 0 | 4,50,000 | 1.000 | 4,50,000 |

| | | | |
|---|---|---|---|
| 1 - 5 | 31,000 | 3.605 | 1,11,755 |
| 6 -10 | 53,000 | 2.045 | 1,08,385 |
| 10 | (57,000) | 0.322 | (18,354) |
| | | | 6,51,786 |

PVAF for 1-10 years 5.65

Equivalent Annual Cost = $\frac{651786}{5.65}$ = ₹ 1,15,360

**Present Value (PV) of cost if machine of Brand ABC is taken on Rent**

| Period | Cash Outflow(₹) | PVF@12% | Present Value |
|---|---|---|---|
| 0 | 1,02,000 | 1.000 | 1,02,000 |
| 1 - 4 | 1,02,500 | 3.037 | 3,11,293 |
| 5-9 | 1,09,950 | 2.291 | 2,51,895 |
| | | | 6,65,188 |

PVAF for 1-10 years = 5.65

Equivalent Annual Cost = $\frac{665188}{5.65}$ = ₹ 1,17,732

Decision: Since Equivalent Annual Cash Outflow is least in case of purchase of Machine of brand XYZ the same should be purchased.

**(ii) If machine is used for 5 years**

(a) Scrap Value of Machine of Brand XYZ
= ₹ 6,00,000 – ₹ 2,00,000 – ₹ 6,00,000 × 0.04 × 4 = ₹ 3,04,000

(b) Scrap Value of Machine of Brand ABC
= ₹ 4,50,000 – ₹ 1,50,000 – ₹ 4,50,000 × 0.06 × 4 = ₹ 1,92,000

**Present Value (PV) of cost if machine of Brand XYZ is purchased**

| Period | Cash Outflow(₹) | PVF@12% | Present Value |
|---|---|---|---|
| 0 | 6,00,000 | 1.000 | 6,00,000 |
| 1 - 5 | 20,000 | 3.605 | 72,100 |
| 5 | (3,04,000) | 0.567 | (1,72,368) |
| | | | 4,99,732 |

**Present Value (PV) of cost if machine of Brand ABC is purchased**

| Period | Cash Outflow(₹) | PVF@12% | Present Value |
|---|---|---|---|
| 0 | 4,50,000 | 1.000 | 4,50,000 |
| 1-5 | 31,000 | 3.605 | 1,11,755 |
| 5 | (1,92,000) | 0.567 | (1,08,864) |
| | | | 4,52,891 |

**Present Value (PV) of cost if machine of Brand ABC is taken on Rent**

| Period | Cash Outflow(₹) | PVF@12% | Present Value |
|---|---|---|---|
| 0 | 1,02,000 | 1.000 | 1,02,000 |
| 1-4 | 1,02,500 | 3.037 | 3,11,293 |
| 5 | 50,000 | 0.567 | 28,350 |
| | | | 4,41,643 |

**Decision:** Since Cash Outflow is least in case of lease of Machine of brand ABC the same should be taken on rent.

**Q.20** Disposing Garbage Car | MTP May 22(1)

A manufacturing company is presently paying a garbage disposer company ₹ 0.50 per kilogram to dispose-off the waste resulting from its manufacturing operations. At normal operating capacity, the waste is about 2,00,000 kilograms per year.

After spending ₹ 1,20,000 on research, the company discovered that the waste could be sold for ₹ 5 per kilogram if it was processed further. Additional processing would, however, require an investment of ₹ 12,00,000 in new equipment, which would have an estimated life of 10 years with no salvage value. Depreciation would be calculated by straight line method.

No change in the present selling and administrative expenses is expected e xcept for the costs incurred in advertising ₹ 40,000 per year, if the new product is sold. Additional processing costs would include variable cost of ₹ 2.50 per kilogram of waste put into process along with fixed cost of ₹ 60,000 per year (excluding Depreciation).

There will be no losses in processing, and it is assumed that the total waste processed in a given year will be sold in the same year. Estimates indicate that 2,00,000 kilograms of the product could be sold each year.

The management when confronted with the choice of disposing off the waste or processing it further and selling it, seeks your ADVICE. Which alternative would you RECOMMEND? Assume that the firm's cost of capital is 15% and it pays on an average 50% Tax on its income.

Consider Present value of Annuity of ₹ 1 per year @ 15% p.a. for 10 years as 5.019.

**Ans.**

**Evaluation of Alternatives:**

**Savings in disposing off the waste**

| Particulars | (₹) |
|---|---|
| Outflow (2,00,000 × ₹ 0.50) | 1,00,000 |
| Less: tax savings @ 50% | 50,000 |
| **Net Outflow per year** | **50,000** |

**Calculation of Annual Cash inflows in Processing of waste Material**

| Particulars | Amount (₹) | Amount (₹) |
|---|---|---|
| Sale value of waste (₹ 5 × 2,00,000 kilograms) | | 10,00,000 |
| Less: Variable processing cost (₹ 2.50 × 2,00,000 kilograms) | 5,00,000 | |
| Less: Fixed processing cost | 60,000 | |
| Less: Advertisement cost | 40,000 | |
| Less: Depreciation | 1,20,000 | (7,20,000) |
| Earnings before tax (EBT) | | **2,80,000** |
| Less: Tax @ 50% | | (1,40,000) |
| Earnings after tax (EAT) | | 1,40,000 |
| Add: Depreciation | | 1,20,000 |
| **Annual Cash inflows** | | **2,60,000** |

Total Annual Benefits = Annual Cash inflows + Net savings (adjusting tax) in disposal cost
= ₹ 2,60,000 + ₹ 50,000 = ₹ 3,10,000

**Calculation of Net Present Value**

| Year | Particulars | Amount (₹) |
|---|---|---|
| 0 | Investment in new equipment | (12,00,000) |
| 1 to 10 | Total Annual benefits × PVAF(10 years, 15%) | 15,55,890 |

| | Net Present Value | 3,55,890 |
|---|---|---|

**Recommendation:** Processing of waste is a better option as it gives a positive Net Present Value.
**Note-** Research cost of ₹ 1,20,000 is not relevant for decision making as it is sunk cost.

**Q.21** Calculate IRR | MTP May 20

A company proposes to install a machine involving a Capital Cost of Rs.72,00,000. The life of the machine is 5 years and its salvage value at the end of the life is nil. The machine will produce the net operating income after depreciation of Rs.13,60,000 per annum. The Company's tax rate is 35%.
The Net Present Value factors for 5 years are as under:

| Discounting Rate : | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|
| Cumulative factor : | 3.43 | 3.35 | 3.27 | 3.20 | 3.13 | 3.06 |

You are required to COMPUTE the internal rate of return (IRR) of the proposal.

**Ans.**

| Computation of cash inflow per annum | Rs. |
|---|---|
| Net operating income per annum | 13,60,000 |
| Less: Tax @ 35% | 4,76,000 |
| Profit after tax | 8,84,000 |
| Add: Depreciation (Rs.72,00,000 / 5 years) | 14,40,000 |
| Cash inflow | 23,24,000 |

The IRR of the investment can be found as follows:
NPV = – Rs. 72,00,000 + Rs. 23,24,000 (PVAF5, r) = 0

or PVA F5 r ( Cumulative factor) = $\frac{7200000}{2324000}$ = 3.09

**Computation of Internal Rate of Return (IRR)**

| Discounting rate | 15% | 19% |
|---|---|---|
| Cumulative factor | 3.35 | 3.06 |
| Total NPV (Rs.) | 77,85,400 | 71,11,440 |
| | (Rs.23,24,000 × 3.35) | ( Rs.23,24,000 × 3.06) |
| Internal outlay (Rs.) | 72,00,000 | 72,00,000 |
| Surplus (Deficit) (Rs.) | 5,85,400 | (88,560) |

$$IRR = LR + \frac{NPV \text{ at } LR}{NPV \text{ at } LR - NPV \text{ at } HR} \times (HR - LR)$$

$$= 15\% + \frac{585400}{585400 - (-88560)} \times (19\% - 15\%)$$

= 15% +3.47 =18.47%

**Q.22** Calculate NPV & IRR | MTP May 18

You are a financial analyst of B Limited. The director of finance has asked you to analyse two capital investments proposals, Projects X and Y. Each project has a cost of ₹10,000 and the cost of capital for each project is 12 per cent. The project's expected net cash flows are as follows:

| Year | Expected net cash flows | |
|---|---|---|
| | Project X (₹) | Project Y (₹) |

| | | |
|---|---|---|
| 0 | (10,000) | (10,000) |
| 1 | 6,500 | 3,500 |
| 2 | 3,000 | 3,500 |
| 3 | 3,000 | 3,500 |
| 4 | 1,000 | 3,500 |

(i) CALCULATE each project's payback period, net present value (NPV) and internal rate of return (IRR).
(ii) DETERMINE, which project or projects should be accepted if they are independent?

**Ans.**

**(i) Payback Period Method**

The cumulative cash flows for each project are as follows

| Year | Cumulative Cash Flows | |
|---|---|---|
| | Project X (₹) | Project Y (₹) |
| 0 | (10,000) | (10,000) |
| 1 | (3,500) | (6,500) |
| 2 | (500) | (3,000) |
| 3 | 2,500 | 500 |
| 4 | 3,500 | 4,000 |

$\text{Payback}_X = 2 + \frac{500}{3000} = 2.17$ years.

$\text{Payback}_Y = 2 + \frac{3000}{3500} = 2.86$ years.

Net Present Value (NPV)

$$NPV_X = -₹\ 10{,}000 + \frac{6500}{(1.12)^1} - \frac{3000}{(1.12)^2} - \frac{3000}{(1.12)^3} - \frac{1000}{(1.12)^4} = ₹\ 966.01$$

$$NPV_Y = -₹\ 10{,}000 + \frac{3500}{(1.12)^1} - \frac{3500}{(1.12)^2} - \frac{3500}{(1.12)^3} - \frac{3500}{(1.12)^4} = -630.72.$$

Internal Rate of Return (IRR)

To solve for each project's IRR, find the discount rates that equate each NPV to zero: IRRx = 18.0%. IRRy = 15.0%.

**(ii)** The following table summarizes the project rankings by each method:

| | Project that ranks higher |
|---|---|
| Payback | X |
| NPV | X |
| IRR | X |

Analysis: All methods rank Project X over Project Y. In addition, both projects are acceptable under the NPV and IRR criteria. Thus, both projects should be accepted if they are independent

**Q.23** MPV & PI Method | PY May 22

Alpha Limited is a manufacturer of computers. It wants to introduce artificial intelligence while making computers. The estimated annual saving from introduction of the artificial intelligence (AI) is as follows:

- reduction of five employees with annual salaries of ₹ 3,00,000 each
- reduction of ₹ 3,00,000 in production delays caused by inventory problem
- reduction in lost sales ₹ 2,50,000 and

- Gain due to timely billing ₹ 2,00,000

The purchase price of the system for installation of artificial intelligence is ₹ 20,00,000 and installation cost is ₹ 1,00,000. 80% of the purchase price will be paid in the year of purchase and remaining will be paid in next year.

The estimated life of the system is 5 years and it will be depreciated on a straight -line basis. However, the operation of the new system requires two computer specialists with annual salaries of ₹ 5,00,000 per person.

In addition to above, annual maintenance and operating cost for five years are as below:

**(Amount in ₹)**

| *Year* | *1* | *2* | *3* | *4* | *5* |
|---|---|---|---|---|---|
| *Maintenance & Operating Cost* | *2,00,000* | *1,80,000* | *1,60,000* | *1,40,000* | *1,20,000* |

Maintenance and operating cost are payable in advance.

The company's tax rate is 30% and its required rate of return is 15%.

| *Year* | *1* | *2* | *3* | *4* | *5* |
|---|---|---|---|---|---|
| *PVIF 0.10, t* | *0.909* | *0.826* | *0.751* | *0.683* | *0.621* |
| *PVIF 0.12, t* | *0.893* | *0.797* | *0.712* | *0.636* | *0.567* |
| *PVIF 0.15, t* | *0.870* | *0.756* | *0.658* | *0.572* | *0.497* |

Evaluate the project by using Net Present Value and Profitability Index

**Ans.**

| **Computation of Annual Cash Flow after Tax** | | | | | | |
|---|---|---|---|---|---|---|
| **Particulars** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| Savings in Salaries | | 15,00,000 | 15,00,000 | 15,00,000 | 15,00,000 | 15,00,000 |
| Reduction in Production Delays | | 3,00,000 | 3,00,000 | 3,00,000 | 3,00,000 | 3,00,000 |
| Reduction in Lost Sales | | 2,50,000 | 2,50,000 | 2,50,000 | 2,50,000 | 2,50,000 |
| Gain due to Timely Billing | | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| Salaryto Computer Specialist | | (10,00,000) | (10,00,000) | (10,00,000) | (10,00,000) | (10,00,000) |
| Maintenance and Operating Cost (payableinadvance) | | (2,00,000) | (1,80,000) | (1,60,000) | (1,40,000) | (1,20,000) |
| Depreciation (21 lakhs/5) | | (4,20,000) | (4,20,000) | (4,20,000) | (4,20,000) | (4,20,000) |
| **Gain Before Tax** | | 6,30,000 | 6,50,000 | 6,70,000 | 6,90,000 | 7,10,000 |
| *Less:* Tax (30%) | | 1,89,000 | 1,95,000 | 2,01,000 | 2,07,000 | 2,13,000 |
| Gain After Tax | | 4,41,000 | 4,55,000 | 4,69,000 | 4,83,000 | 4,97,000 |
| *Add:* Depreciation | | 4,20,000 | 4,20,000 | 4,20,000 | 4,20,000 | 4,20,000 |
| *Add:* Maintenance and Operating Cost (payable in advance) | | 2,00,000 | 1,80,000 | 1,60,000 | 1,40,000 | 1,20,000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Less:* Maintenance and Operating Cost (payable in advance) | (2,00,000) | (1,80,000) | (1,60,000) | (1,40,000) | (1,20,000) | - |
| **Net CFAT** | (2,00,000) | 8,81,000 | 8,95,000 | 9,09,000 | 9,23,000 | 10,37,000 |

Note: Annual cash flows can also be calculated Considering tax shield on depreciation & maintenance and operating cost. There will be no change in the final cash flows after tax.

| Computation of NPV | | | | |
|---|---|---|---|---|
| **Particulars** | **Year** | **Cash Flows (₹)** | **PVF** | **PV (₹)** |
| Initial Investment (80% of 20 Lacs) | 0 | 16,00,000 | 1 | 16,00,000 |
| Installation Expenses | 0 | 1,00,000 | 1 | 1,00,000 |
| Instalment of Purchase Price | 1 | 4,00,000 | 0.870 | 3,48,000 |
| **PV of Outflows (A)** | | | | **20,48,000** |
| CFAT | 0 | (2,00,000) | 1 | (2,00,000) |
| CFAT | 1 | 8,81,000 | 0.870 | 7,66,470 |
| CFAT | 2 | 8,95,000 | 0.756 | 6,76,620 |
| CFAT | 3 | 9,09,000 | 0.658 | 5,98,122 |
| CFAT | 4 | 9,23,000 | 0.572 | 5,27,956 |
| CFAT | 5 | 10,37,000 | 0.497 | 5,15,389 |
| **PV of Inflows (B)** | | | | 28,84,557 |
| **NPV (B-A)** | | | | **8,36,557** |
| **Profitability Index (B/A)** | | | | **1.408 or 1.41** |

Evaluation: Since the NPV is positive (i.e. ₹ 8,36,557) and Profitability Index is also greater than 1 (i.e. 1.41), Alpha Ltd. may introduce artificial intelligence (AI) while making computers.

**Q.24** Calculate NPV, PI & Disc Payback | PY Jan 21

A company wants to buy a machine, and two different models namely A and B are available.
Following further particulars are available:

| *Particulars* | *Machine-A* | *Machine-B* |
|---|---|---|
| *Original Cost (₹)* | *8,00,000* | *6,00,000* |
| *Estimated Life in years* | *4* | *4* |
| *Salvage Value (₹)* | *0* | *0* |

The company provides depreciation under Straight Line Method. Income tax rate applicable is 30%.
The present value of ₹ 1 at 12% discounting factor and net profit before depreciation and tax are as under:

| *Year* | *Net Profit Before Depreciation and tax* | | *PV Factor* |
|---|---|---|---|
| | *Machine-A* ₹ | *Machine-B* ₹ | |
| *1.* | *2,30,000* | *1,75,000* | *0.893* |
| *2.* | *2,40,000* | *2,60,000* | *0.797* |
| *3.* | *2,20,000* | *3,20,000* | *0.712* |
| *4.* | *5,60,000* | *1,50,000* | *0.636* |

Calculate:

1. NPV (Net Present Value)
2. Discounted pay-back period
3. PI (Profitability Index)

Suggest: Purchase of which machine is more beneficial under Discounted pay-back period method, NPV method and PI method.

**Ans.** **Workings:**

**(i) Calculation of Annual Depreciation**

Depreciation on Machine – A = $\frac{800000}{4}$ = ₹ 2,00,000

Depreciation on Machine – B = $\frac{600000}{4}$ = ₹ 1,50,000

**(ii) Calculation of Annual Cash Inflows**

| Particulars | Machine-A (₹) | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Net Profit before Depreciation and Tax | 2,30,000 | 2,40,000 | 2,20,000 | 5,60,000 |
| *Less:* Depreciation | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| Profit before Tax | 30,000 | 40,000 | 20,000 | 3,60,000 |
| *Less:* Tax @ 30% | 9,000 | 12,000 | 6,000 | 1,08,000 |
| Profit after Tax | 21,000 | 28,000 | 14,000 | 2,52,000 |
| *Add:* Depreciation | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| **Annual Cash Inflows** | **2,21,000** | **2,28,000** | **2,14,000** | **4,52,000** |

| Particulars | Machine-B (₹) | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Net Profit before Depreciation and Tax | 1,75,000 | 2,60,000 | 3,20,000 | 1,50,000 |
| *Less:* Depreciation | 1,50,000 | 1,50,000 | 1,50,000 | 1,50,000 |
| Profit before Tax | 25,000 | 1,10,000 | 1,70,000 | 0 |
| *Less:* Tax @ 30% | 7,500 | 33,000 | 51,000 | 0 |
| Profit after Tax | 17,500 | 77,000 | 1,19,000 | 0 |
| *Add:* Depreciation | 1,50,000 | 1,50,000 | 1,50,000 | 1,50,000 |
| **Annual Cash Inflows** | **1,67,500** | **2,27,000** | **2,69,000** | **1,50,000** |

(iii) Calculation of PV of Cash Flows

| | Machine – A | | | | Machine – B | | |
|---|---|---|---|---|---|---|---|
| Year | PV of Re 1 @ 12% | Cash flow (₹) | PV (₹) | Cumulative PV (₹) | Cash flow (₹) | PV (₹) | Cumulative PV (₹) |
| 1 | 0.893 | 2,21,000 | 1,97,353 | 1,97,353 | 1,67,500 | 1,49,578 | 1,49,578 |
| 2 | 0.797 | 2,28,000 | 1,81,716 | 3,79,069 | 2,27,000 | 1,80,919 | 3,30,497 |
| 3 | 0.712 | 2,14,000 | 1,52,368 | 5,31,437 | 2,69,000 | 1,91,528 | 5,22,025 |
| 4 | 0.636 | 4,52,000 | 2,87,472 | 8,18,909 | 1,50,000 | 95,400 | 6,17,425 |

1. **NPV (Net Present Value)**

**Machine – A**

NPV = ₹ 8,18,909 - ₹ 8,00,000 = **₹ 18,909**

**Machine – B**

NPV = ₹ 6,17,425 – ₹ 6,00,000 = **₹ 17,425**

2. **Discounted Payback Period**

**Machine – A**

$$\text{Discounted Payback Period} = 3 + \frac{800000 - 531437}{287472}$$

$$= 3 + 0.934$$

= 3.934 years or 3 years 11.21 months

**Machine – B**

$$\text{Discounted Payback Period} = 3 + \frac{600000 - 522025}{95400}$$

$$= 3 + 0.817$$

= 3.817 years or 3 years 9.80 months

3. **PI (Profitability Index)**

**Machine – A**

$$\text{Profitability Index} = \frac{818909}{800000} = 1.024$$

**Machine – B**

$$\text{Profitability Index} = \frac{617425}{600000} = 1.029$$

**Suggestion:**

| Method | Machine - A | Machine - B | Suggested Machine |
|---|---|---|---|
| Net Present Value | ₹ 18,909 | ₹ 17,425 | **Machine A** |
| Discounted Payback Period | 3.934 years | 3.817 years | **Machine B** |
| Profitability Index | 1.024 | 1.029 | **Machine B** |

**Q.25** NPV & PI Method | RTP Nov 22

K. K. M. M Hospital is considering purchasing an MRI machine. Presently , the hospital is outsourcing the work received relating to MRI machine and is earning commission of ₹ 6,60,000 per annum (net of tax). The following details are given regarding the machine:

| | (₹) |
|---|---|
| Cost of MRI machine | 90,00,000 |
| Operating cost per annum (excluding Depreciation) | 14,00,000 |
| Expected revenue per annum | 45,00,000 |
| Salvage value of the machine (after 5 years) | 10,00,000 |
| Expected life of the machine | 5 years |

Assuming tax rate @ 40%, whether it would be profitable for the hospital to purchase the machine?
Give your RECOMMENDATION under:
(i) Net Present Value Method, and
(ii) Profitability Index Method.
PV factors at 10% are given below

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **PV factor** | 0.909 | 0.826 | 0.751 | 0.683 | 0.620 |

**Ans.**

**Determination of Cash inflows**

| Elements | (₹) |
|---|---|
| Sales Revenue | 45,00,000 |
| *Less:* Operating Cost | 14,00,000 |
| | 31,00,000 |
| *Less:* Depreciation (90,00,000 – 10,00,000)/5 | 16,00,000 |
| Net Income | 15,00,000 |
| Tax @ 40% | 6,00,000 |
| Earnings after Tax (EAT) | 9,00,000 |
| *Add:* Depreciation | 16,00,000 |
| Cash inflow after tax per annum | 25,00,000 |
| *Less:* Loss of Commission Income | 6,60,000 |
| Net Cash inflow after tax per annum | 18,40,000 |
| New Cash inflow after tax | 18,40,000 |
| *Add:* Salvage Value of Machine | 10,00,000 |
| Net Cash inflow in year 5 | 28,40,000 |

**Calculation of Net Present Value (NPV)**

| Year | CFAT | PV Factor @10% | Present Value of Cashin flows |
|---|---|---|---|
| 1 to 4 | 18,40,000 | 3.169 | 58,30,960 |
| 5 | 28,40,000 | 0.620 | 17,60,800 |
| | | | 75,91,760 |
| *Less:* Cash Outflows | | | 90,00,000 |
| NPV | | | (14,08,240) |

Profitability Index = $\frac{\text{Sum of discounted cash inflows}}{\text{Present value of cash out flows}} = \frac{7591760}{9000000}$ = 0.844

**Advise:** Since the net present value is negative and profitability index is also less than 1, therefore, the hospital should not purchase the MRI machine.

**Q.26** Calculate NPV, PI & Disc Payback | RTP May 18

A company has to make a choice between two projects namely A and B. The initial capital outlay of two Projects are ₹ 1,35,000 and ₹ 2,40,000 respectively for A and B. There will be no scrap value at the end of the life of both the projects. The opportunity Cost of Capital of the company is 16%. The annual incomes are as under:

| Year | Project A (₹) | Project B (₹) | Discounting factor @ 16% |
|---|---|---|---|
| 1 | -- | 60,000 | 0.862 |
| 2 | 30,000 | 84,000 | 0.743 |
| 3 | 1,32,000 | 96,000 | 0.641 |
| 4 | 84,000 | 1,02,000 | 0.552 |
| 5 | 84,000 | 90,000 | 0.476 |

Required:

CALCULATE for each project:
(i) Discounted payback period
(ii) Profitability index
(iii) Net present value
DECIDE which of these projects should be accepted?

**Ans.** **Working notes**

**1 Computation of Net Present Values of Projects**

| Year | Cash flows | | Disct. factor @ 16 % | Discounted Cash flow | |
|---|---|---|---|---|---|
| | Project A (₹ ) | Project B (₹ ) | | Project A (₹) | Project B (₹ ) |
| | (1) | (2) | (3) | (3) × (1) | (3) × (2) |
| 0 | (1,35,000) | (2,40,000) | 1.000 | (1,35,000) | (2,40,000) |
| 1 | -- | 60,000 | 0.862 | -- | 51,720 |
| 2 | 30,000 | 84,000 | 0.743 | 22,290 | 62,412 |
| 3 | 1,32,000 | 96,000 | 0.641 | 84,612 | 61,536 |
| 4 | 84,000 | 1,02,000 | 0.552 | 46,368 | 56,304 |
| 5 | 84,000 | 90,000 | 0.476 | 39,984 | 42,840 |
| Net present value | | | | 58,254 | 34,812 |

**2 Computation of Cumulative Present Values of Projects Cash inflows**

| Year | Project A | | Project B | |
|---|---|---|---|---|
| | PV of cash inflows (₹) | Cumulative PV (₹) | PV of cash inflows (₹) | Cumulative PV (₹) |
| 1 | -- | -- | 51,720 | 51,720 |
| 2 | 22,290 | 22,290 | 62,412 | 1,14,132 |
| 3 | 84,612 | 1,06,902 | 61,536 | 1,75,668 |
| 4 | 46,368 | 1,53,270 | 56,304 | 2,31,972 |
| 5 | 39,984 | 1,93,254 | 42,840 | 2,74,812 |

(i) Discounted payback period: (Refer to Working note 2)
Cost of Project A = ₹ 1,35,000
Cost of Project B = ₹ 2,40,000
Cumulative PV of cash inflows of Project A after 4 years = ₹ 1,53,270
Cumulative PV of cash inflows of Project B after 5 years = ₹ 2,74,812
A comparison of projects cost with their cumulative PV clearly shows that the project A's cost will be recovered in less than 4 years and that of project B in less than 5 years. The exact duration of discounted payback period can be computed as follows:

| | Project A | Project B |
|---|---|---|
| Excess PV of cash Inflows over the project cost (₹) | 18,270 (₹ 1,53,270 – ₹ 1,35,000) | 34,812 (₹ 2,74,812 – ₹ 2,40,000) |
| Computation of period required to recover excess | 0.39 year (₹ 18,270 ÷₹ 46,368) | 0.81 years (₹ 34,812 ÷ ₹ 42,840) |

| | | |
|---|---|---|
| amount of cumulative PV over project cost (Refer to Working note 2) | | |
| Discounted payback period | 3.61 year (4 – 0.39) years | 4.19 years (5 – 0.81) years |

**(ii) Profitability Index(PI):** $= \frac{\text{Sum of discounted cash inflows}}{\text{Initian cash outlay}}$

Profitability Index (for Project A) $= \frac{193245}{135000}$

Profitability Index (for Project B) $= \frac{274812}{240000}$

**(iii)** **Net present value(NPV)** (for Project A) = ₹ 58,254
**Net present value(NPV)** (for Project B) = ₹ 34,812
(Refer to Working note 1)

**Conclusion:** As the NPV, PI of Project A is higher and Discounted Pay back is lower, therefore Project a should be accepted.

**Q.27** NPV, PI & Payback Method | MTP Dec 21(1)

Sadbhavna Limited is a manufacturer of computers. It wants to introduce artificial intelligence while making computers. It estimates that the annual savings from the artificial intelligence (AI) include a reduction of five employees with annual salaries of ₹ 3,00,000 each, ₹ 3,00,000 from reduction in production delays caused by inventory problem, reduction in lost sales ₹ 2,50,000 and ₹ 2,00,000 from billing issues.

The purchase price of the system for installation of artificial intelligence is ₹ 20,00,000 with installation cost of ₹ 1,00,000. The life of the system is 5 years and it will be depreciated on a straight -line basis. The salvage value is zero which will be its market value after the end of its life of five years.

However, the operation of the new system for AI requires two computer specialists with annual salaries of ₹ 5,00,000 per person. Also, the estimated maintenance and operating expenses of 1,50,000 is required.

The company's tax rate is 30% and its required rate of return is 12%.

From the above information:

(i) CALCULATE the initial cash outflow and annual operating cash flow over its life of 5 years.

(ii) Further, EVALUATE the project by using Payback Period, Net Present Value and Profitability Index.

(iii) You are also REQUIRED to obtain the cash flows and NPV on the assumption that book salvage value for depreciation purposes is ₹ 2,00,000 even though the machine is having no real worth in terms of its resale value. Also, the book salvage value of ₹ 2,00,000 is allowed for tax purposes.

Also COMMENT on the acceptability of the project in (ii) and (iii) above.

**Ans.** **(i) Project's Initial Cash Outlay**

| | | |
|---|---|---|
| Cost | 20,00,000 | |
| Installation Expenses | 1,00,000 | |
| Total Cash Outflow | 21,00,000 | |
| Depreciation per year = 21,00,000/5 = | 4,20,000 | |
| **Project's Operating Cash Flows over its 5-year life** | | |
| **Savings (A)** | | |
| Reduction in salaries (₹ 3,00,000 x 5) | | 15,00,000 |
| Reduction in production delays | | 3,00,000 |
| Reduction in lost sales | | 2,50,000 |
| Gains due to timely billing | | 2,00,000 |
| | | **22,50,000** |

| | |
|---|---|
| **Costs (B)** | |
| - Depreciation | 4,20,000 |
| - Additional Specialist Cost (₹ 5,00,000 x 2) | 10,00,000 |
| - Maintenance Cost | 1,50,000 |
| | **15,70,000** |
| Increase in Profit before tax (A – B) | 6,80,000 |
| Less: Tax @ 30% | 2,04,000 |
| Profit after tax | **4,76,000** |

Cash Inflows = Profit after tax + Depreciation
= 4,76,000 + 4,20,000 = 8,96,000

(ii) Evaluation of the project by using NPV Method

| Year | Cash Inflows | PVAF (12%,5y) | Total PV |
|---|---|---|---|
| 1-5 | 8,96,000 | 3.605 | 32,30,080 |
| **Less: Total Initial Cash Outflow** | | | 21,00,000 |
| **Net Present Value** | | | **11,30,080** |

Since NPV is positive, therefore, the project is acceptable.

**Evaluation of the project by using Profitability Index Method**

Profitability Index = Present Value of Cash Inflows/Present Value of Cash Outflows
= 32,30,080/21,00,000
= 1.538

Since, the profitability index is more than 1, the project is acceptable.

**Calculation of the Project's Payback***

| Year | Net Cash Flow | Cumulative Cash Flow |
|---|---|---|
| 1 | 8,96,000 | 8,96,000 |
| 2 | 8,96,000 | 17,92,000 |
| 3 | 8,96,000 | 26,88,000 |
| 4 | 8,96,000 | 35,84,000 |
| 5 | 8,96,000 | 44,80,000 |

Here, the payback period is 2 years plus a fraction of the 3rd year
So, payback period = 2 years + 3,08,000/8,96,000
= 2.34 years

* Payback period may also be solved directly as follows: 21,00,000/8,96,000 = 2.34 years

(iii) **Project's cash flows and NPV assuming that the book salvage for depreciation purpose is ₹2,00,000**

Depreciation = (₹ 21,00,000 – 2,00,000)/5 = 3,80,000

**Cash Inflows for the years 1 to 5 are:**

| | | |
|---|---|---|
| Savings (calculated as earlier) | | 22,50,000 |
| Less: Costs | | |
| - Depreciation | 3,80,000 | |
| - Additional Specialists cost | 10,00,000 | |
| - Maintenance cost | 1,50,000 | 15,30,000 |
| Profit before tax | | **7,20,000** |
| Less: Tax @ 30% | | 2,16,000 |
| Profit after tax | | 5,04,000 |
| Cash Inflow (5,04,000 + 3,80,000) | | 8,84,000 |

**Calculation of NPV**

It may be noted that at the end of year 5, the book value of the project would be ₹ 2,00,000 but its realizable value is nil. So, the capital loss of ₹ 2,00,000 will result in tax savings of ₹ 60,000 (i.e., ₹ 2,00,000 x 30%), as the capital loss is available for tax purposes in view of the information given. Therefore, at the end of year 5, there would be an additional inflow of ₹ 60,000. The NPV may now be calculated as follows:

| Year | Cash Flow (₹) | PVAF (12%, n) | PV |
|---|---|---|---|
| 1-5 | 8,84,000 | 3.605 | 31,86,820 |
| 5 | 60,000 | 0.567 | 34,020 |
| PV of inflows | | | 32,20,840 |
| Outflows | | | 21,00,000 |
| NPV | | | 11,20,840 |

As the NPV of the project is positive, the project is acceptable.

**Q.28** NPV, PI & Payback Method | MTP May 19(1)

X Ltd. is considering to select a machine out of two mutually exclusive machines. The company's cost of capital is 15 per cent and corporate tax rate is 30 per cent. Other information relating to both machines is as follows:

| | Machine – I | Machine – II |
|---|---|---|
| Cost of Machine | Rs. 30,00,000 | Rs. 40,00,000 |
| Expected Life | 10 years. | 10 years. |
| Annual Income (Before Tax and Depreciation) | Rs. 12,50,000 | Rs. 17,50,000 |

Depreciation is to be charged on straight line basis: You are required to CALCULATE:

(i) Discounted Pay Back Period

(ii) Net Present Value

(iii) Profitability Index

The present value factors of Re.1 @ 15% are as follows:

| Year | 01 | 02 | 03 | 04 | 05 |
|---|---|---|---|---|---|
| PV factor @ 15% | 0.870 | 0.756 | 0.658 | 0.572 | 0.497. |

**Ans.**

**Working Notes:**

Depreciation on Machine – I $= \frac{3000000}{10} =$ Rs. 3,00,000

Depreciation on Machine – II $= \frac{4000000}{10} =$ Rs. 4,00,000

| Particulars | Machine-I (Rs.) | Machine – II (Rs.) |
|---|---|---|
| Annual Income (before Tax and Depreciation) | 12,50,000 | 17,50,000 |
| Less: Depreciation | 3,00,000 | 4,00,000 |
| Annual Income (before Tax) | 9,50,000 | 13,50,000 |
| Less: Tax @ 30% | (2,85,000) | (4,05,000) |
| Annual Income (after Tax) | 6,65,000 | 9,45,000 |
| Add: Depreciation | 3,00,000 | 4,00,000 |
| Annual Cash Inflows | 9,65,000 | 13,45,000 |

| Year | Machine – I | | | | Machine - II | | |
|---|---|---|---|---|---|---|---|
| | PV of Re 1 @ 15% | Cash flow | PV | Cumulative PV | Cash flow | PV | Cumulative PV |
| 1 | 0.870 | 9,65,000 | 8,39,550 | 8,39,550 | 13,45,000 | 11,70,150 | 11,70,150 |
| 2 | 0.756 | 9,65,000 | 7,29,540 | 15,69,090 | 13,45,000 | 10,16,820 | 21,86,970 |
| 3 | 0.658 | 9,65,000 | 6,34,970 | 22,04,060 | 13,45,000 | 8,85,010 | 30,71,980 |
| 4 | 0.572 | 9,65,000 | 5,51,980 | 27,56,040 | 13,45,000 | 7,69,340 | 38,41,320 |
| 5 | 0.497 | 9,65,000 | 4,79,605 | 32,35,645 | 13,45,000 | 6,68,465 | 45,09,785 |

**(i) Discounted Payback Period**

Machine – I

$$\text{Discounted Payback Period} = 4 + \frac{(3000000 - 2756040)}{479605}$$

$$= 4 + \frac{243960}{479605} = 4 + 0.5087 \quad = 4.5087 \text{ years or 4 years 6.10 months}$$

Machine – II

$$\text{Discounted Payback Period} = 4 + \frac{(4000000 - 3841320)}{668465}$$

$$= 4 + \frac{158680}{668465} = 4 + 0.2374 \quad = 4.2374 \text{ years or 4 years 2.85 months}$$

**(ii) Net Present Value (NPV)**

Machine – I

NPV = 32,35,645 – 30,00,000 = Rs. 2,35,645

Machine – II

NPV = 45,09,785 – 40,00,000 = Rs. 5,09,785

**(iii) Profitability Index**

Machine – I

$$\text{Profitability Index} = \frac{3235645}{3000000} = 1.08$$

Machine – II

$$\text{Profitability Index} = \frac{4509785}{4000000} = 1.13$$

**Conclusion:**

| Method | Machine - I | Machine - II | Rank |
|---|---|---|---|
| Discounted Payback Period | 4.51 years | 4.24 years | II |
| Net Present Value | Rs. .2,35,645 | Rs. 5,09,785 | II |
| Profitability Index | 1.08 | 1.13 | II |

**Q.29** NPV, PI & Payback Method | MTP Nov 18(2)

A company has to make a choice between two projects namely A and B. The initial capital outlay of two Projects are Rs.1,35,00,000 and Rs.2,40,00,000 respectively for A and B. There will be no scrap value at the end of the life of both the projects. The opportunity cost of capital of the company is 16%. The annual incomes are as under:

| Year | Project A | Project B | Discounting factor @ 16% |
|---|---|---|---|
| 1 | -- | 60,00,000 | 0.862 |
| 2 | 30,00,000 | 84,00,000 | 0.743 |
| 3 | 1,32,00,000 | 96,00,000 | 0.641 |
| 4 | 84,00,000 | 1,02,00,000 | 0.552 |
| 5 | 84,00,000 | 90,00,000 | 0.476 |

You are required to CALCULATE for each project:

(i) Discounted payback period

(ii) Profitability index

(iii) Net present value

**Ans.**

**(1) Computation of Net Present Values of Projects** **(Amount in Rs. '000)**

| Year | Cash flows | | Discount factor @ 16 % | Discounted Cash flow | |
|---|---|---|---|---|---|
| | Project A (Rs.) | Project B (Rs.) | | Project A (Rs.) | Project B (Rs.) |
| | (1) | (2) | (3) | (3) × (1) | (3) × (2) |
| 0 | (13,500) | (24,000) | 1.000 | (13,500) | (24,000) |
| 1 | -- | 6,000 | 0.862 | -- | 5,172 |
| 2 | 3,000 | 8,400 | 0.743 | 2,229 | 6,241.2 |
| 3 | 13,200 | 9,600 | 0.641 | 8,461.2 | 6,153.6 |
| 4 | 8,400 | 10,200 | 0.552 | 4,636.8 | 5,630.4 |
| 5 | 8,400 | 9,000 | 0.476 | 3,998.4 | 4,284 |
| Net present value | | | | 5,825.4 | 3,481.2 |

(2) Computation of Cumulative Present Values of Projects Cash inflows

(Amount in Rs. '000)

| Year | Project A | | Project B | |
|---|---|---|---|---|
| | PV of cash inflows (Rs.) | Cumulative PV (Rs.) | PV of cash inflows (Rs.) | Cumulative PV (Rs.) |
| 1 | -- | -- | 5,172 | 51,72 |
| 2 | 2,229 | 22,29 | 6,241.2 | 11,413.2 |
| 3 | 8,461.2 | 10,690.2 | 6,153.6 | 17,566.8 |
| 4 | 4,636.8 | 15,327 | 5,630.4 | 23,197.2 |
| 5 | 3,998.4 | 19,325.4 | 4,284 | 27,481.2 |

(i) Discounted payback period: (Refer to Working note 2)

Cost of Project A = Rs.1,35,00,000

Cost of Project B = Rs.2,40,00,000

Cumulative PV of cash inflows of Project A after 4 years = Rs.1,53,27,000

Cumulative PV of cash inflows of Project B after 5 years = Rs.2,74,81,200

A comparison of projects cost with their cumulative PV clearly shows that the project A's cost will be recovered in less than 4 years and that of project B in less than 5 years. The exact duration of discounted payback period can be computed as follows :

| | Project A | Project B |
|---|---|---|
| Excess PV of cash inflows over the project cost (Rs.) | 18,27,000 (Rs.1,53,27,000 – Rs.1,35,00,000) | 34,81,200 (Rs. 2,74,81,200 – Rs.2,40,00,000) |

| | | |
|---|---|---|
| Computation of period required to recover excess amount of cumulative PV over project cost (Refer to Working note 2) | 0.39 year<br>(Rs. 18,27,000 ÷ Rs.46,36,800) | 0.81 years<br>(Rs.34,81,200 ÷ Rs. 42,84,000) |
| Discounted payback period | 3.61 year<br>(4 – 0.39) years | 4.19 years<br>(5 – 0.81) years |

(ii) Profitability Index: = $\frac{\text{Sum of discounted cash inflows}}{\text{Initian cash outlay}}$

Profitability Index (for Project A) = $\frac{19325400}{13500000}$ = 1.43

Profitability Index (for Project B) = $\frac{27481200}{24000000}$ = 1.15

(iii) Net present value (for Project A) = Rs.58,25,400 (Refer to Working note 1)
Net present value (for Project B) = Rs.34,81,200

**Q.30** NPV, PI & Payback Method | MTP Nov 18(1)

X Limited is considering to purchase of new plant worth Rs. 80,00,000. The expected net cash flows after taxes and before depreciation are as follows:

| Year | Net Cash Flows (Rs.) |
|---|---|
| 1 | 14,00,000 |
| 2 | 14,00,000 |
| 3 | 14,00,000 |
| 4 | 14,00,000 |
| 5 | 14,00,000 |
| 6 | 16,00,000 |
| 7 | 20,00,000 |
| 8 | 30,00,000 |
| 9 | 20,00,000 |
| 10 | 8,00,000 |

The rate of cost of capital is 10%. You are required to CALCULATE
(i) Pay-back period
(ii) Net present value at 10 discount factor
(iii) Profitability index at 10 discount factor
(iv) Internal rate of return with the help of 10% and 15% discount factor
The following present value table is given for you:

| Year | Present value of Rs. 1 at 10% discount rate | Present value of Rs. 1 at 15% discount rate |
|---|---|---|
| 1 | .909 | .870 |

| | | |
|---|---|---|
| 2 | .826 | .756 |
| 3 | .751 | .658 |
| 4 | .683 | .572 |
| 5 | .621 | .497 |
| 6 | .564 | .432 |
| 7 | .513 | .376 |
| 8 | .467 | .327 |
| 9 | .424 | .284 |
| 10 | .386 | .247 |

**Ans.**

**(i) Calculation of Pay-back Period**

Cash Outlay of the Project = Rs. 80,00,000
Total Cash Inflow for the first five years = Rs. 70,00,000
Balance of cash outlay left to be paid back in the 6th year Rs. 10,00,000
Cash inflow for 6th year = 16,00,000
So the payback period is between 5th and 6th years, i.e.,

$$5 \text{ years} + \frac{1000000}{600000} = 5.625 \text{ years or } 5 \text{ years } 7.5 \text{ months}$$

**(ii) Calculation of Net Present Value (NPV) @10% discount rate:**

| Year | Net Cash Inflow (Rs.) | Present Value at Discount Rate of 10% | Present Value (Rs.) |
|---|---|---|---|
| | (a) | (b) | (c) = (a) × (b) |
| 1 | 14,00,000 | 0.909 | 12,72,600 |
| 2 | 14,00,000 | 0.826 | 11,56,400 |
| 3 | 14,00,000 | 0.751 | 10,51,400 |
| 4 | 14,00,000 | 0.683 | 9,56,200 |
| 5 | 14,00,000 | 0.621 | 8,69,400 |
| 6 | 16,00,000 | 0.564 | 9,02,400 |
| 7 | 20,00,000 | 0.513 | 10,26,000 |
| 8 | 30,00,000 | 0.467 | 14,01,000 |
| 9 | 20,00,000 | 0.424 | 8,48,000 |
| 10 | 8,00,000 | 0.386 | 3,08,800 |
| | | | 97,92,200 |

Net Present Value (NPV) = Cash Outflow – Present Value of Cash Inflows
= Rs. 80,00,000 – Rs. 97,92,200 = 17,92,200

**(iii) Calculation of Profitability Index @ 10% discount rate:**

$$\text{Profitability Index} = \frac{\text{Present Value of Cash inflows}}{\text{Cost of the investment}}$$

$$= \frac{9792200}{8000000} = 1.224$$

**(iv) Calculation of Internal Rate of Return:**

Net present value @ 10% interest rate factor has already been ca lculated in (ii) above, we will calculate Net present value @15% rate factor.

| Year | Net Cash Inflow (Rs.) | Present Value at Discount Rate of 15% | Present Value (Rs.) |
|---|---|---|---|
| | (a) | (b) | (c) = (a)× (b) |
| 1 | 14,00,000 | 0.870 | 12,18,000 |
| 2 | 14,00,000 | 0.756 | 10,58,400 |
| 3 | 14,00,000 | 0.658 | 9,21,200 |
| 4 | 14,00,000 | 0.572 | 8,00,800 |
| 5 | 14,00,000 | 0.497 | 6,95,800 |
| 6 | 16,00,000 | 0.432 | 6,91,200 |
| 7 | 20,00,000 | 0.376 | 7,52,000 |
| 8 | 30,00,000 | 0.327 | 9,81,000 |
| 9 | 20,00,000 | 0.284 | 5,68,000 |
| 10 | 8,00,000 | 0.247 | 1,97,600 |
| | | | 78,84,000 |

Net Present Value at 15% = Rs. 78,84,000 – Rs. 80,00,000 = Rs. -1,16,000

As the net present value @ 15% discount rate is negative, hence internal rate of return falls in between 10% and 15%. The correct internal rate of return can be calculated as follows:

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H - L)$$

$$= 10\% + \frac{1792200}{1792200 - (-116000)}(15\% - 10\%)$$

$$= 10\% + \frac{1792200}{1908200} \times 5\% = 14.7\%$$

**Q.31** Calculate NPV | MTP May 21(2)

(a) SG Ltd. is considering a project "Z" with an initial outlay of Rs. 7,50,000 and life of 5 years. The estimates of project are as follows:

| | Lower Estimates | Base | Upper Estimates |
|---|---|---|---|
| Sales (units) | 4,500 | 5,000 | 5,500 |
| | (Rs.) | (Rs.) | (Rs.) |
| Selling Price p.u. | 175 | 200 | 225 |
| Variable cost p.u. | 100 | 125 | 150 |
| Fixed Cost | 50,000 | 75,000 | 1,00,000 |

Depreciation included in Fixed cost is Rs. 35,000 and corporate tax is 25%.

Assuming the cost of capital as 15%, DETERMINE NPV in three scenarios i.e worst, base and best case scenario. PV factor for 5 years at 15% are as follows:

| Years | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| P.V. factor | 0.870 | 0.756 | 0.658 | 0.572 | 0.497 |

**Ans.** **(i) Calculation of Yearly Cash Inflow**

In worst case: High costs and Low price (Selling price) and volume(Sales units) are taken.
In best case: Low costs and High price(Selling price) and volume(Sales units) are taken.

| | Worst Case | Base | Best Case |
|---|---|---|---|
| Sales (units) (A) | 4,500 | 5,000 | 5,500 |
| | (Rs.) | (Rs.) | (Rs.) |
| Selling Price p.u. | 175 | 200 | 225 |
| *Less:* Variable cost p.u. | 150 | 125 | 100 |
| Contribution p.u. (B) | 25 | 75 | 125 |
| Total Contribution (A x B) | 1,12,500 | 3,75,000 | 6,87,500 |
| *Less:* Fixed Cost | 1,00,000 | 75,000 | 50,000 |
| EBT | 12,500 | 3,00,000 | 6,37,500 |
| *Less:* Tax @ 25% | 3,125 | 75,000 | 1,59,375 |
| *EAT* | 9,375 | 2,25,000 | 4,78,125 |
| *Add: Depreciation* | 35,000 | 35,000 | 35,000 |
| *Cash Inflow* | 44,375 | 2,60,000 | 5,13,125 |

(ii) Calculation of NPV in different scenarios

| | Worst Case | Base | Best Case |
|---|---|---|---|
| Initial outlay (A) (Rs.) | 7,50,000 | 7,50,000 | 7,50,000 |
| Cash Inflow (c) (Rs.) | 44,375 | 2,60,000 | 5,13,125 |
| Cumulative PVF @ 15% (d) | 3.353 | 3.353 | 3.353 |
| PV of Cash Inflow (B = c x d) (Rs.) | 1,48,789.38 | 8,71,780 | 17,20,508.13 |
| NPV (B - A) (Rs.) | (6,01,210.62) | 1,21,780 | 9,70,508.13 |

**Q.32** Calculate NPV | MTP Nov 19

H Ltd. is considering a new product line to supplement its range of products. It is anticipated that the new product line will involve cash investments of Rs.70,00,000 at time 0 and Rs.1,00,00,000 in year 1. After-tax cash inflows of Rs. 25,00,000 are expected in year 2, Rs.30,00,000 in year 3, Rs.35,00,000 in year 4 and Rs.40,00,000 each year thereafter through year 10. Although the product line might be viable after year 10, the company prefers to be conservative and end all calculations at that time.

(i) If the required rate of return is 15 per cent, FIND OUT the net present value of the project? Is it acceptable?
(ii) COMPUTE NPV if the required rate of return were 10 per cent?
(iii) COMPUTE the internal rate of return?

**Ans.** **(i)**

| Year | Cash flow | Discount Factor (15%) | Present value |
|---|---|---|---|
| | (Rs.) | | (Rs.) |
| 0 | (70,00,000) | 1.000 | (70,00,000) |
| 1 | (1,00,00,000) | 0.870 | (87,00,000) |
| 2 | 25,00,000 | 0.756 | 18,90,000 |
| 3 | 30,00,000 | 0.658 | 19,74,000 |
| 4 | 35,00,000 | 0.572 | 20,02,000 |

| | | | |
|---|---|---|---|
| 5–10 | 40,00,000 | 2.163 | 86,52,000 |
| | | Net Present Value | (11,82,000) |

As the net present value is negative, the project is unacceptable.

**(ii) Similarly, NPV at 10% discount rate can be computed as follows:**

| Year | Cash flow | Discount Factor (10%) | Present value |
|---|---|---|---|
| | (Rs.) | | (Rs.) |
| 0 | (70,00,000) | 1.000 | (70,00,000) |
| 1 | (1,00,00,000) | 0.909 | (90,90,000) |
| 2 | 25,00,000 | 0.826 | 20,65,000 |
| 3 | 30,00,000 | 0.751 | 22,53,000 |
| 4 | 35,00,000 | 0.683 | 23,90,500 |
| 5–10 | 40,00,000 | 2.974 | 1,18,96,000 |
| | | Net Present Value | 25,14,500 |

Since NPV = Rs.25,14,500 is positive, hence the project would be acceptable.

(iii) $$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H - L)$$

$$= 10\% + \frac{2514500}{2514500 - (-)1182000} \times (15\% - 10\%)$$

$$= 10\% + 3.4012 \text{ or } 13.40\%$$

**Q.33** Calculate NPV | MTP May 19(2)

Probabilities for net cash flows for 3 years of a project of Ganesh Ltd are as follows:

| Year 1 | | Year 2 | | Year 3 | |
|---|---|---|---|---|---|
| Cash Flow (Rs.) | Probability | Cash Flow (Rs.) | Probability | Cash Flow (Rs.) | Probability |
| 2,000 | 0.1 | 2,000 | 0.2 | 2,000 | 0.3 |
| 4,000 | 0.2 | 4,000 | 0.3 | 4,000 | 0.4 |
| 6,000 | 0.3 | 6,000 | 0.4 | 6,000 | 0.2 |
| 8,000 | 0.4 | 8,000 | 0.1 | 8,000 | 0.1 |

CALCULATE the expected net cash flows and the present value of the expected cash flow, using 10 per cent discount rate. Initial Investment is Rs. 10,000

**Ans.**

| Year 1 | | | Year 2 | | | Year 3 | | |
|---|---|---|---|---|---|---|---|---|
| Cash Flow (Rs.) | Probability | Expecte Value (Rs.) | Cash Flow (Rs.) | Probability | Expected Value (Rs.) | Cash Flow (Rs.) | Probability | Expecte d Value (Rs.) |
| 2,000 | 0.1 | 200 | 2,000 | 0.2 | 400 | 2,000 | 0.3 | 600 |
| 4,000 | 0.2 | 800 | 4,000 | 0.3 | 1200 | 4,000 | 0.4 | 1,600 |
| 6,000 | 0.3 | 1,800 | 6,000 | 0.4 | 2400 | 6,000 | 0.2 | 1,200 |
| 8,000 | 0.4 | 3,200 | 8,000 | 0.1 | 800 | 8,000 | 0.1 | 800 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ENCF | | 6,000 | | | 4,800 | | | 4,200 |

The present value of the expected value of cash flow at 10 per cent discount rate has been determined as follows:

Present Value of cash flow $= \frac{ENCF_1}{(1+K)^1} + \frac{ENCF_2}{(1+K)^2} + \frac{ENCF_3}{(1+K)^3}$

$= \frac{6000}{(1.1)^1} + \frac{4800}{(1+1)^2} + \frac{4200}{(1.1)^3}$

= (6,000 × 0.909) + (4,800 × 0.826) + (4,200 + 0.751) = 12,573

Expected Net Present value = Present Value of cash flow - Initial Investment

= Rs. 12,573 – Rs.10,000 = Rs.2,573.

**Q.34** NPV Method (Accept/Not) | PY Nov 20

CK Ltd. is planning to buy a new machine. Details of which are as follows:

| | |
|---|---|
| Cost of the Machine at the commencement | ₹ 2,50,000 |
| Economic Life of the Machine | 8 year |
| Residual Value | Nil |
| Annual Production Capacity of the Machine | 1,00,000 units |
| Estimated Selling Price per unit | ₹ 6 |
| Estimated Variable Cost per unit | ₹ 3 |
| Estimated Annual Fixed Cost (Excluding depreciation) | ₹ 1,00,000 |
| Advertisement Expenses in 1st year in addition of annual fixed cost | ₹ 20,000 |
| Maintenance Expenses in 5th year in addition of annual fixed cost | ₹ 30,000 |
| Cost of Capital | 12% |

Ignore Tax.

Analyse the above mentioned proposal using the Net Present Value Method and advice. P.V. factor @ 12% are as under:

| *Year* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* |
|---|---|---|---|---|---|---|---|---|
| *PV Factor* | *0.893* | *0.797* | *0.712* | *0.636* | *0.567* | *0.507* | *0.452* | *0.404* |

**Ans.**

**Calculation of Net Cash flows**

Contribution = (₹ 6 – ₹ 3) × 1,00,000 units = ₹ 3,00,000

Fixed costs (excluding depreciation) = ₹ 1,00,000

| Year | Capital (₹) | Contribution (₹) | Fixed costs (₹) | Advertisement/ Maintenance expenses (₹) | Net cash flow (₹) |
|---|---|---|---|---|---|
| 0 | (2,50,000) | | | | (2,50,000) |
| 1 | | 3,00,000 | (1,00,000) | (20,000) | 1,80,000 |
| 2 | | 3,00,000 | (1,00,000) | | 2,00,000 |
| 3 | | 3,00,000 | (1,00,000) | | 2,00,000 |
| 4 | | 3,00,000 | (1,00,000) | | 2,00,000 |
| 5 | | 3,00,000 | (1,00,000) | (30,000) | 1,70,000 |

| | | | | | |
|---|---|---|---|---|---|
| 6 | | 3,00,000 | (1,00,000) | | 2,00,000 |
| 7 | | 3,00,000 | (1,00,000) | | 2,00,000 |
| 8 | | 3,00,000 | (1,00,000) | | 2,00,000 |

Calculation of Net Present Value

| Year | Net cash flow (₹) | 12% discount factor | Present value (₹) |
|---|---|---|---|
| 0 | (2,50,000) | 1.000 | (2,50,000) |
| 1 | 1,80,000 | 0.893 | 1,60,740 |
| 2 | 2,00,000 | 0.797 | 1,59,400 |
| 3 | 2,00,000 | 0.712 | 1,42,400 |
| 4 | 2,00,000 | 0.636 | 1,27,200 |
| 5 | 1,70,000 | 0.567 | 96,390 |
| 6 | 2,00,000 | 0.507 | 1,01,400 |
| 7 | 2,00,000 | 0.452 | 90,400 |
| 8 | 2,00,000 | 0.404 | 80,800 |
| | | | 7,08,730 |

**Advise:** CK Ltd. should buy the new machine, as the net present value of the proposal is positive i.e ₹ 7,08,730.

**Q.35** MPV & Payback Method | PY Nov 18

PD Ltd. an existing company, is planning to introduce a new product with projected life of 8 years. Project cost will be ₹ 2,40,00,000. At the end of 8 years no residual value will be realized. Working capital of ₹ 30,00,000 will be needed. The 100% capacity of the project is 2,00,000 units p.a. but the Production and Sales Volume is expected are as under :

| Year | Number of Units |
|---|---|
| 1 | 60,000 units |
| 2 | 80,000 units |
| 3-5 | 1,40,000 units |
| 6-8 | 1,20,000 units |

Other Information:

(i) Selling price per unit ₹ 200

(ii) Variable cost is 40 of sales.

(iii) Fixed cost p.a. ₹ 30,00,000.

(iv) In addition to these advertisement expenditure will have to be incurred as under:

| *Year* | *1* | *2* | *3-5* | *6-8* |
|---|---|---|---|---|
| *Expenditure (₹)* | *50,00,000* | *25,00,000* | *10,00,000* | *5,00,000* |

(v) Income Tax is 25%.

(vi) Straight line method of depreciation is permissible for tax purpose. (vii) Cost of capital is 10%.

(viii) Assume that loss cannot be carried forward.

| *Year* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* |
|---|---|---|---|---|---|---|---|---|
| *PVF@ 10* | *0.909* | *0.826* | *0.751* | *0.683* | *0.621* | *0.564* | *0.513* | *0.467* |

Advise about the project acceptability.

**Ans.**

**Computation of initial cash outlay(COF)**

| | (₹ in lakhs) |
|---|---|
| Project Cost | 240 |
| Working Capital | 30 |
| | 270 |

Calculation of Cash Inflows(CIF):

| Years | 1 | 2 | 3-5 | 6-8 |
|---|---|---|---|---|
| Sales in units | 60,000 | 80,000 | 1,40,000 | 1,20,000 |
| | ₹ | ₹ | ₹ | ₹ |
| Contribution (₹ 200 x 60% x No. of Unit) | 72,00,000 | 96,00,000 | 1,68,00,000 | 1,44,00,000 |
| *Less:* Fixed cost | 30,00,000 | 30,00,000 | 30,00,000 | 30,00,000 |
| *Less:* Advertisement | 50,00,000 | 25,00,000 | 10,00,000 | 5,00,000 |
| *Less:* Depreciation (24000000/8) = 30,00,000 | 30,00,000 | 30,00,000 | 30,00,000 | 30,00,000 |
| Profit /(loss) | (38,00,000) | 11,00,000 | 98,00,000 | 79,00,000 |
| *Less*: Tax @ 25% | NIL | 2,75,000 | 24,50,000 | 19,75,000 |
| Profit/(Loss) after tax | (38,00,000) | 8,25,000 | 73,50,000 | 59,25,000 |
| *Add*: Depreciation | 30,00,000 | 30,00,000 | 30,00,000 | 30,00,000 |
| Cash inflow | (8,00,000) | 38,25,000 | 1,03,50,000 | 89,25,000 |

(Note: Since variable cost is 40%, Contribution shall be 60% of sales)

**Computation of PV of CIF**

| Year | CIF | PV Factor | |
|---|---|---|---|
| | ₹ | @ 10% | ₹ |
| 1 | (8,00,000) | 0.909 | (7,27,200) |
| 2 | 38,25,000 | 0.826 | 31,59,450 |
| 3 | 1,03,50,000 | 0.751 | 77,72,850 |
| 4 | 1,03,50,000 | 0.683 | 70,69,050 |
| 5 | 1,03,50,000 | 0.621 | 64,27,350 |
| 6 | 89,25,000 | 0.564 | 50,33,700 |
| 7 | 89,25,000 | 0.513 | 45,78,525 |
| 8 | 89,25,000 | | |
| Working Capital | 30,00,000 | 0.467 | 55,68,975 |
| | | | 3,88,82,700 |
| | PV of COF | | 2,70,00,000 |
| | | NPV | 1,18,82,700 |

Recommendation: Accept the project in view of positive NPV.

**Q.36** NPV Method (Accept/Not) | PY May 19

AT Limited is considering three projects A, B and C. The cash flows associated with the projects are given below:

Cash flows associated with the Three Projects (₹)

| Project | $C_0$ | $C_1$ | $C_2$ | $C_3$ | $C_3$ |
|---|---|---|---|---|---|
| A | (10,000) | 2,000 | 2,000 | 6,000 | 0 |
| B | (2,000) | 0 | 2,000 | 4,000 | 6,000 |
| C | (10,000) | 2,000 | 2,000 | 6,000 | 10,000 |

You are required to :

(a) Calculate the payback period of each of the three projects.

(b) If the cut-off period is two years, then which projects should be accepted?

(c) Projects with positive NPVs if the opportunity cost of capital is 10 percent.

(d) "Payback gives too much weight to cash flows that occur after the cut-off date". True or false?

(e) "If a firm used a single cut-off period for all projects, it is likely to accept too many short lived projects." True or false?

P.V. Factor @ 10 %

| Year | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| P.V. | 1.000 | 0.909 | 0.826 | 0.751 | 0.683 | 0.621 |

**Ans.**

**(a) Payback Period of Projects**

| Projects | $C_0$ (₹) | $C_1$ (₹) | $C_2$ (₹) | $C_3$ (₹) | Payback |
|---|---|---|---|---|---|
| A | (10,000) | 2000 | 2000 | 6,000 | 2,000+2,000+6,000 =10,000 i.e 3 years |
| B | (2,000) | 0 | 2,000 | NA | 0+2,000 = 2,000 i.e 2 years |
| C | (10,000) | 2000 | 2000 | 6,000 | 2,000+2,000+6,000 = 10,000 i.e 3 years |

(b) If standard payback period is 2 years, Project B is the only acceptable project.

(c) Calculation of NPV

| Year | PVF @ 10% | Project A | | Project B | | Project C | |
|---|---|---|---|---|---|---|---|
| | | Cash Flows (₹) | PV of cash flows (₹) | Cash Flows (₹) | PV of cash flows (₹) | Cash Flows (₹) | PV of cash flows (₹) |
| 0 | 1 | (10,000) | (10,000) | (2,000) | (2,000) | (10,000) | (10,000) |
| 1 | 0.909 | 2,000 | 1,818 | 0 | 0 | 2,000 | 1,818 |
| 2 | 0.826 | 2,000 | 1,652 | 2,000 | 1,652 | 2,000 | 1,652 |
| 3 | 0.751 | 6,000 | 4506 | 4,000 | 3004 | 6,000 | 4,506 |
| 4 | 0.683 | 0 | 0 | 6,000 | 4,098 | 10,000 | 6,830 |
| NPV | | | (-2,024) | | 6,754 | | 4,806 |

So, Projects with positive NPV are Project B and Project C

**(d)** **False.** Payback gives no weightage to cash flows after the cut-off date.

**(e)** **True.** The payback rule ignores all cash flows after the cutoff date, meaning that future years' cash inflows are not considered. Thus, payback is biased towards short-term projects.

**Q.37** NPV Method (Machine Replace) | RTP Nov 18

Shiv Limited is thinking of replacing its existing machine by a new machine which would cost ₹ 60 lakhs. The company's current production is 80,000 units, and is expected to increase to 1,00,000 units, if the new machine is bought. The selling price of the product would remain unchanged at ₹ 200 per unit. The following is the cost of producing one unit of product using both the existing and new machine:

| | | | Unit cost (₹) |
|---|---|---|---|
| | Existing Machine (80,000 units) | New Machine (1,00,000 units) | Difference |
| Materials | 75.0 | 63.75 | (11.25) |
| Wages & Salaries | 51.25 | 37.50 | (13.75) |
| Supervision | 20.0 | 25.0 | 5.0 |
| Repairs and Maintenance | 11.25 | 7.50 | (3.75) |
| Power and Fuel | 15.50 | 14.25 | (1.25) |
| Depreciation | 0.25 | 5.0 | 4.75 |
| Allocated Corporate Overheads | 10.0 | 12.50 | 2.50 |
| | 183.25 | 165.50 | (17.75) |

The existing machine has an accounting book value of ₹ 1,00,000, and it has been fully depreciated for tax purpose. It is estimated that machine will be useful for 5 years. The supplier of the new machine has offered to accept the old machine for ₹ 2,50,000. However, the market price of old machine today is ₹ 1,50,000 and it is expected to be ₹ 35,000 after 5 years. The new machine has a life of 5 years and a salvage value of ₹ 2,50,000 at the end of its economic life. Assume corporate Income tax rate at 40%, and depreciation is charged on straight line basis for Income-tax purposes. Further assume that book profit is treated as ordinary income for tax purpose. The opportunity cost of capital of the Company is 15%.

Required:

(i) ESTIMATE net present value of the replacement decision.

(ii) CALCULATE the internal rate of return of the replacement decision.

(iii) Should Company go ahead with the replacement decision? ANALYSE.

| Year (t) | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| $PVIF_{0.15t}$ | 0.8696 | 0.7561 | 0.6575 | 0.5718 | 0.4972 |
| $PVIF_{0.20t}$ | 0.8333 | 0.6944 | 0.5787 | 0.4823 | 0.4019 |
| $PVIF_{0.25t}$ | 0.80 | 0.64 | 0.512 | 0.4096 | 0.3277 |
| $PVIF_{0.30t}$ | 0.7692 | 0.5917 | 0.4552 | 0.3501 | 0.2693 |
| $PVIF_{0.35t}$ | 0.7407 | 0.5487 | 0.4064 | 0.3011 | 0.2230 |

**Ans.** **(i)** Net Cash Outlay of New Machine

| | |
|---|---|
| Purchase Price | ₹ 60,00,000 |
| Less: Exchange value of old machine [2,50,000 – 0.4(2,50,000 – 0)] | 1,50,000 |
| | ₹ 58,50,000 |

**Market Value of Old Machine:** The old machine could be sold for ₹ 1,50,000 in the market. Since the exchange value is more than the market value, this option is not attractive. This opportunity will be lost whether the old machine is retained or replaced. Thus, on incremental basis, it has no impact.

**Depreciation base:** Old machine has been fully depreciated for tax purpose.

Thus, the depreciation base of the new machine will be its original cost i.e. ₹ 60,00,000.

**Net Cash Flows:** Unit cost includes depreciation and allocated overheads. Allocated overheads are allocated from corporate office therefore they are irrelevant. The depreciation tax shield may be computed separately. Excluding depreciation and allocated overheads, unit costs can be calculated. The company will obtain additional revenue from additional 20,000 units sold.

Thus, after-tax saving, excluding depreciation, tax shield, would be

= {100,000(200 – 148) – 80,000(200 – 173)} × (1 – 0.40)

= {52,00,000 – 21,60,000} × 0.60

= ₹ 18,24,000

After adjusting depreciation tax shield and salvage value, net cash flows and net present value are estimated.

**Calculation of Cash flows and Project Profitability**

| | | | | | | ₹ ('000) |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 |
| 1 After-tax savings | - | 1824 | 1824 | 1824 | 1824 | 1824 |
| 2 Depreciation (₹ 60,00,000 – 2,50,000)/5 | - | 1150 | 1150 | 1150 | 1150 | 1150 |
| 3 Tax shield on depreciation (Depreciation × Tax rate) | - | 460 | 460 | 460 | 460 | 460 |
| 4 Net cash flows from operations (1 + 3)* | - | 2284 | 2284 | 2284 | 2284 | 2284 |
| 5 Initial cost | (5850) | | | | | |
| 6 Net Salvage Value | - | - | - | - | - | 215 |
| 7 Net Cash Flows (4+5+6) | (5850) | 2284 | 2284 | 2284 | 2284 | 2499 |
| 8 PVF at 15% | 1.00 | 0.8696 | 0.7561 | 0.6575 | 0.5718 | 0.4972 |
| 9 PV | (5850) | 1986.166 | 1726.932 | 1501.73 | 1305.99 | 1242.50 |
| 10 NPV | ₹ 1913.32 | | | | | |

* Alternately Net Cash flows from operation can be calculated as follows:

Profit before depreciation and tax = ₹ 1,00,000 (200 -148) - 80,000 (200 -173)

= ₹ 52,00,000 – 21,60,000

= ₹ 30,40,000

So profit after depreciation and tax is ₹ (30,40,000 -11,50,000) × (1 - .40)

= ₹ 11,34,000

So profit before depreciation and after tax is :

₹ 11,34,000 + ₹ 11,50,000 (Depreciation added back) = ₹ 22,84,000

**(ii)**

| | | | | | | ₹ ('000) |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 |
| NCF | (5850) | 2284 | 2284 | 2284 | 2284 | 2499 |
| PVF at 20% | 1.00 | 0.8333 | 0.6944 | 0.5787 | 0.4823 | 0.4019 |
| PV | (5850) | 1903.257 | 1586.01 | 1321.751 | 1101.57 | 1004.35 |
| PV of benefits | 6916.94 | | | | | |
| PVF at 30% | 1.00 | 0.7692 | 0.5917 | 0.4550 | 0.3501 | 0.2693 |
| PV | (5850) | 1756.85 | 1351.44 | 1039.22 | 799.63 | 672.98 |
| PV of benefits | 5620.12 | | | | | |

$$IRR = 20\% + 10\% \times \frac{1066.94}{1296.82} = 28.23\%$$

(iii) Advise: The Company should go ahead with replacement project, since it is positive NPV decision.

**Q.38** NPV, Payback & Disc Payback | PY Nov 19

A company has ₹ 1,00,000 available for investment and has identified the following four investments in which to invest.

| Project | Investment (₹) | NPV (₹) |
|---|---|---|
| C | 40,000 | 20,000 |
| D | 1,00,000 | 35,000 |
| E | 50,000 | 24,000 |
| F | 60,000 | 18,000 |

You are required to optimize the returns from a package of projects within the capital spending limit if-

(i) The projects are independent of each other and are divisible.

(ii) The projects are not divisible.

**Ans.** **(i) Optimizing returns when projects are independent and divisible.**

**Computation of NPVs per Re. 1 of Investment and Ranking of the Projects**

| Project | Investment (₹) | NPV (₹) | NPV per Re. 1 invested (₹) | Ranking |
|---|---|---|---|---|
| C | 40,000 | 20,000 | 0.50 | 1 |
| D | 1,00,000 | 35,000 | 0.35 | 3 |
| E | 50,000 | 24,000 | 0.48 | 2 |
| F | 60,000 | 18,000 | 0.30 | 4 |

Building up of a Package of Projects based on their Rankings

| Project | Investment (₹) | NPV (₹) |
|---|---|---|
| C | 40,000 | 20,000 |
| E | 50,000 | 24,000 |
| D (1/10th of Project) | 10,000 | 3,500 |
| Total | 1,00,000 | 47,500 |

The company would be well advised to invest in Projects C, E and D (1/10 th) and reject Project F to optimise return within the amount of ₹ 1,00,000 available for investment.

(ii) Optimizing returns when projects are indivisible.

| Package of Project | Investment (₹) | Total NPV (₹) |
|---|---|---|
| C and E | 90,000 (40,000 + 50,000) | 44,000 (20,000 + 24,000) |
| C and F | 1,00,000 (40,000 + 60,000) | 38,000 (20,000 + 18,000) |
| Only D | 1,00,000 | 35,000 |

The company would be well advised to invest in Projects C and E to optimise return within the amount of ₹ 1,00,000 available for investment.

**Q.39** NPV, Payback & Disc Payback | MTP Nov 23(1)

A firm can make investment in either of the following two projects. The firm anticipates its cost of capital to be 10%. The pre-tax cash flows of the projects for five years are as follows:

| Year | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Project A (₹) | (3,00,000) | 55,000 | 1,20,000 | 1,30,000 | 1,05,000 | 40,000 |
| Project B (₹) | (3,00,000) | 3,18,000 | 20,000 | 20,000 | 8,000 | 6,000 |

Ignore Taxation.

An amount of ₹ 45,000 will be spent on account of sales promotion in year 3 in case of Project A. This has not been considered in calculation of pre-tax cash flows.

The discount factors are as under:

| Year | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| PVF (10%) | 1 | 0.91 | 0.83 | 0.75 | 0.68 | 0.62 |

You are required to calculate for each project:

(i) The payback period

(ii) The discounted payback period

(iii) Desirability factor

(iv) Net Present Value

**Ans.**

**Calculation of Present Value of cash flows**

| Year | PV factor @ 10% | Project A | | Project B | |
|---|---|---|---|---|---|
| | | Cash flows (₹) | Discounted Cash flows | Cash flows (₹) | Discounted Cash flows |
| 0 | 1.00 | (3,00,000) | (3,00,000) | (3,00,000) | (3,00,000) |
| 1 | 0.91 | 55,000 | 50,050 | 3,18,000 | 2,89,380 |
| 2 | 0.83 | 1,20,000 | 99,600 | 20,000 | 16,600 |
| 3 | 0.75 | 85,000(1,30,000-45,000) | 63,750 | 20,000 | 15,000 |
| 4 | 0.68 | 1,05,000 | 71,400 | 8,000 | 5,440 |
| 5 | 0.62 | 40,000 | 24,800 | 6,000 | 3,720 |
| Net Present Value | | | **9,600** | | **30,140** |

**(i) The Payback period of the projects:**

**Project-A:** The cumulative cash inflows up-to year 3 is ₹2,60,000 and remaining amount required to equate the cash outflow is ₹ 40,000 i.e. (₹ 3,00,000 – ₹ 2,60,000) which will be recovered from year-4 cash inflow. Hence, Payback period will be calculated as below:

$$3 \text{ years} + \frac{40000}{105000} = 3.381 \text{ years or } 3 \text{ years, } 4 \text{ months, } 9 \text{ days (approx.)}$$

**Project-B:** The cash inflow in year-1 is ₹ 3,18,000 and the amount required to equate the cash outflow is ₹ 3,00,000, which can be recovered in a period less than a year. Hence, Payback period will be calculated as below:

$$\frac{300000}{318000} = 0.943 \text{ years or } 11 \text{ months}$$

**(ii) Discounted Payback period for the projects:**

**Project-A:** The cumulative discounted cash inflows up-to year 4 is ₹ 2,84,800 and remaining amount required to equate the cash outflow is ₹ 15,200 i.e. (₹ 3,00,000 – ₹ 2,84,800) which will be recovered from year-5 cash inflow. Hence, Payback period will be calculated as below:

4 years + $\frac{15200}{24800}$ = 4.613 years or 4 years, 2 months, and 11 days

**Project-B:** The cash inflow in year-1 is ₹2,89,380 and remaining amount required to equate the cash outflow is ₹ 10,620 i.e. (₹ 3,00,000 – ₹ 2,89,380) which will be recovered from year-2 cash inflow. Hence, Payback period will be calculated as below:

1 year + $\frac{10620}{16600}$ = 1.640 years or 1 Year, 7 months and 23 days.

**(iii) Desirability factor of the projects**

Desirability Factor (Profitability Index) = $\frac{\text{Discounted value Cash Inflows}}{\text{Discounted value of Cash}}$

Project A = $\frac{309600}{300000}$ = 1.032

Project B = $\frac{330140}{300000}$ = 1.100

**(iv) Net Present Value (NPV) of the projects:**

Please refer the above table.

Project A- ₹ 9,600

Project B- ₹ 30,140

**Q.40** Purchase Machine or Not | MTP May 23(2)

(a) Rambow Ltd. is contemplating purchasing machinery that would cost ₹ 10,00,000 plus GST @ 18% at the beginning of year 1. Cash inflows after tax from operations have been estimated at ₹ 2,56,000 per annum for 5 years. The company has two options for the smooth functioning of the machinery - one is service, and another is replacement of parts. The company has the option to service a part of the machinery at the end of each of the years 2 and 4 at ₹ 1,00,000 plus GST @ 18% for each year. In such a case, the scrap value at the end of year 5 will be ₹ 76,000. However, if the company decides not to service the part, then it will have to be replaced at the end of year 3 at ₹ 3,00,000 plus GST@ 18% and in this case, the machinery will work for the 6th year also and get operational cash inflow of ₹ 1,86,000 for the 6th year. It will have to be scrapped at the end of year 6 at ₹ 1,36,000.

Assume cost of capital at 12% and GST paid on all inputs including capital goods are eligible for input tax credit in the same month as and when incurred.

(i) DECIDE whether the machinery should be purchased under option 1 or under option 2 or it shouldn't be purchased at all.

(ii) If the supplier gives a discount of ₹ 90,000 for purchase, WHAT would be your decision? Note: The PV factors at 12% are:

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| PV Factor | 1 | 0.8928 | 0.7972 | 0.7118 | 0.6355 | 0.5674 | 0.5066 |

**Ans.**

**Option I: Purchase Machinery and Service Part at the end of Year 2 and 4.**

Net Present value of cash flow @ 12% per annum discount rate.

NPV (in ₹) = - 10,00,000 + 2,56,000 x (0.8928+0.7972+0.7118+0.6355+0.5674) – (1,00,000 x 0.7972+1,00,000 x 0.6355) + (76,000 x 0.5674)

= - 10,00,000 + (2,56,000 x 3.6047) – 1,43,270+43,122.4

= - 10,00,000 + 9,22,803.2 – 1,43,270+ 43,122.4

NPV = - 1,77,344.4

Since Net Present Value is negative; therefore, this option is not to be considered.

**If Supplier gives a discount of ₹ 90,000, then:**

NPV (in ₹) = + 90,000 - 1,77,344.4 = -87,344.4

In this case, Net Present Value is still negative; therefore, this option may not be advisable

**Option II: Purchase Machinery and Replace Part at the end of Year 2.**

NPV (in ₹)= - 10,00,000 + 2,56,000 x (0.8928+0.7972+0.7118+0.6355+0.5674) – (3,00,000 x 0.7118) + (1,86,000 x 0.5066+1,36,000 x 0.5066)
= - 10,00,000 + (2,56,000 x 3.6047) – 2,13,540+1,63,125.2
= - 10,00,000 + 9,22,803.2 – 2,13,540+1,63,125.2
NPV = - 1,27,611.6
Net Present Value is negative, the machinery should not be purchased.
**If the Supplier gives a discount of ₹ 90,000, then:**
NPV (in ₹) = 90,000 - 1,27,611.6 = - 37,611.6
In this case, Net Present Value is still negative; therefore, this option may not be advisa ble.
**Decision: The Machinery should not be purchased as it will earn a negative NPV in both options of repair and replacement.**

**Q.41** Purchase Machine or Not — MTP May 23(1)

Yellow bells Ltd. wants to replace its old machine with new automatic machine. The old machine had been fully depreciated for tax purpose but has a book value of ₹3,50,000 on 31st March 2022. The machine cannot fetch more than ₹45,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹1,60,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹6,50,000. The expected life of new machine is 10 years with salvage value of ₹63,000. Further, the company follows straight line depreciation method but for tax purpose, wri tten down value method depreciation @ 9% is allowed taking that this is the only machine in the block of assets.
Given below are the expected sales and costs from both old and new machine:

| | Old machine (₹) | New machine (₹) |
|---|---|---|
| Sales | 11,74,500 | 11,74,500 |
| Material cost | 2,61,000 | 1,83,063 |
| Labour cost | 1,95,750 | 1,59,500 |
| Variable overhead | 81,563 | 68,875 |
| Fixed overhead | 1,30,500 | 1,41,375 |
| Depreciation | 34,800 | 60,175 |
| Profit Before Tax (PBT) | 4,70,888 | 5,61,513 |
| Tax @ 25% | 1,17,722 | 1,40,378 |
| Profit After Tax (PAT) | 3,53,166 | 4,21,134 |

From the above information, ANALYSE whether the old machine should be replaced or not if required rate of return is 10%? Ignore capital gain tax.
PV factors @ 10%:

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| PVF | 0.909 | 0.826 | 0.751 | 0.683 | 0.621 | 0.564 | 0.513 | 0.467 | 0.424 | 0.386 |

**Ans.**

**(i) Calculation of Base for depreciation or Cost of New Machine**

| Particulars | (₹) |
|---|---|
| Purchase price of new machine | 6,50,000 |
| Less: Sale price of old machine | 1,60,000 |
| | **4,90,000** |

**(iii) Calculation of Profit before tax as per books**

| Particulars | Old machine (₹) | New machine (₹) | Difference (₹) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| PBT as per books | 4,70,888 | 5,61,513 | 90,625 |
| Add: Depreciation as per books | 34,800 | 60,175 | 25,375 |
| Profit before tax and depreciation | 5,05,688 | 6,21,688 | 1,16,000 |

**Calculation of Incremental NPV**

| Year | PVF @ 10% | PBTD (₹) | Dep. @ 9% (₹) | PBT (₹) | Tax @ 25% (₹) | Cash Inflows (₹) | PV of Cash Inflows (₹) |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4(2-3) | (5) = (4) x 0.25 | (6) = (4) –(5) + (3) | (7) = (6) x (1) |
| 1 | 0.909 | 1,16,000.00 | 44,100.00 | 71,900.00 | 17,975.00 | 98,025.00 | 89,104.73 |
| 2 | 0.826 | 1,16,000.00 | 40,131.00 | 75,869.00 | 18,967.25 | 97,032.75 | 80,149.05 |
| 3 | 0.751 | 1,16,000.00 | 36,519.21 | 79,480.79 | 19,870.20 | 96,129.80 | 72,193.48 |
| 4 | 0.683 | 1,16,000.00 | 33,232.48 | 82,767.52 | 20,691.88 | 95,308.12 | 65,095.45 |
| 5 | 0.621 | 1,16,000.00 | 30,241.56 | 85,758.44 | 21,439.61 | 94,560.39 | 58,722.00 |
| 6 | 0.564 | 1,16,000.00 | 27,519.82 | 88,480.18 | 22,120.05 | 93,879.95 | 52,948.29 |
| 7 | 0.513 | 1,16,000.00 | 25,043.03 | 90,956.97 | 22,739.24 | 93,260.76 | 47,842.77 |
| 8 | 0.467 | 1,16,000.00 | 22,789.16 | 93,210.84 | 23,302.71 | 92,697.29 | 43,289.63 |
| 9 | 0.424 | 1,16,000.00 | 20,738.14 | 95,261.86 | 23,815.47 | 92,184.53 | 39,086.24 |
| 10 | 0.386 | 1,16,000.00 | 18,871.70 | 97,128.30 | 24,282.07 | 91,717.93 | 35,403.12 |
| | | | | | | | 5,83,834.77 |
| Add: PV of Salvage value of new machine (₹ 63,000 ´ 0.386) | | | | | | | 24,318.00 |
| Total PV of incremental cash inflows | | | | | | | 6,08,152.77 |
| Less: Cost of new machine [as calculated in point(i)] | | | | | | | 4,90,000.00 |
| Incremental Net Present Value | | | | | | | 1,18,152.77 |

**Analysis: Since the Incremental NPV is positive, the old machine should be replaced.**

**Q.42** Purchase Machine or Not | MTP Nov 22(1)

Emb ros Ltd. is planning to invest in a new product with a project life of 8 years. Initial equipment cost will be ₹ 35 crores. Additional equipment costing ₹ 2.50 crores will be purchased at the end of the third year from the cash inflow of this year. At the end of 8th year, the original equipment will have no resale value, but additional equipment can be sold at 10% of its original cost. A working capital of ₹ 4 crores will be needed, and it will be released at the end of 8th year. The project will be financed with sufficient amount of equity capital.

The sales volumes over eight years have been estimated as follows:

| Year | 1 | 2 | 3 | 4-5 | 6-8 |
|---|---|---|---|---|---|
| Units | 14,40,000 | 21,60,000 | 52,00,000 | 54,00,000 | 36,00,000 |

Sales price of ₹ 120 per unit is expected and variable expenses will amount to 60% of sales revenue. Fixed cash operating costs will amount ₹ 3.60 crores per year. The loss of any year will be set off from the profits of subsequent year. The company follows straight line method of depreciation and is subject to 30% tax rate. Considering 12% after tax cost of capital for this project, you are required to CALCULATE the net present value (NPV) of the project and advise the management to take appropriate decision.

PV factors @ 12% are:

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| | .893 | .797 | .712 | .636 | .567 | .507 | .452 | .404 |

**Ans.**

**Calculation of year-wise Cash Inflow** **(₹ in crores)**

| Year | Sales | VC (60% of Sales Value) | FC | Dep. | Profit | Tax (@30%) | PAT | Dep. | Cash inflow |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 17.28 | 10.368 | 3.6 | 4.375 | (1.063) | - | (1.0630) | 4.375 | 3.312 |
| 2 | 25.92 | 15.552 | 3.6 | 4.375 | 2.393 | 0.3990* | 1.9940 | 4.375 | 6.369 |
| 3 | 62.4 | 37.44 | 3.6 | 4.375 | 16.985 | 5.0955 | 11.8895 | 4.375 | 16.2645 |
| 4-5 | 64.8 | 38.88 | 3.6 | 4.825# | 17.495 | 5.2485 | 12.2465 | 4.825 | 17.0715 |
| 6-8 | 43.2 | 25.92 | 3.6 | 4.825 | 8.855 | 2.6565 | 6.1985 | 4.825 | 11.0235 |

*(30% of 2.393 – 30% of 1.063) = 0.7179 – 0.3189 = 0.3990

#4.375 + (2.50 - .25)/5 = 4.825

**Calculation of Cash Outflow at the beginning**

| Particulars | ₹ |
|---|---|
| Cost of New Equipment | 35,00,00,000 |
| Add: Working Capital | 4,00,00,000 |
| Outflow | 39,00,00,000 |

**Calculation of NPV**

| Year | Cash inflows (₹) | PV factor | NPV (₹) |
|---|---|---|---|
| 1 | 3,31,20,000 | .893 | 2,95,76,160 |
| 2 | 6,36,90,000 | .797 | 5,07,60,930 |
| 3 | 16,26,45,000 - 2,50,00,000 = 13,76,45,000 | .712 | 9,80,03,240 |
| 4 | 17,07,15,000 | .636 | 10,85,74,740 |
| 5 | 17,07,15,000 | .567 | 9,67,95,405 |
| 6 | 11,02,35,000 | .507 | 5,58,89,145 |
| 7 | 11,02,35,000 | .452 | 4,98,26,220 |
| 8 | 11,02,35,000 + 4,00,00,000 + 25,00,000 = 15,27,35,000 | .404 | 6,17,04,940 |
| | Present Value of Inflow | | 55,11,30,780 |
| | Less: Out flow | | 39,00,00,000 |
| | **Net Present Value** | | **16,11,30,780** |

Advise: Since the project has a positive NPV, it may be accepted.

**Q.43** Purchase Machine or Not | MTP May 22(2)

Manoran jan Ltd is a News broadcasting channel having its broadcasting Centre in Mumbai. There are total 200 employees in the organisation including top management. As a part of employee benefit expenses, the company serves tea or coffee to its employees, which is outsourced from a third -party. The company offers tea or coffee three times a day to each of its employees. 120 employees prefer tea all three times, 40 employees prefer coffee all three times and remaining prefer tea only once in a day. The third-party charges ₹ 10 for each cup of tea and ₹ 15 for each cup of coffee. The company works for 200 days in a year.

Looking at the substantial amount of expenditure on tea and coffee, the finance department has proposed to the management an installation of a master tea and coffee vending machine which will cost ₹ 10,00,000 with a useful life of five years. Upon purchasing the machine, the company will have to enter into an annual maintenance contract with the vendor, which will require a payment of ₹ 75,000 every year. The machine would require electricity consumption of 500 units p.m. and current incremental cost of electricity for the company is ₹ 12 per unit. Apart from these running costs, the company will have to incur the following consumables expenditure also:

(1) Packets of Coffee beans at a cost of ₹ 90 per packet.
(2) Packet of tea powder at a cost of ₹ 70 per packet.
(3) Sugar at a cost of ₹ 50 per Kg.
(4) Milk at a cost of ₹ 50 per litre.
(5) Paper cup at a cost of 20 paise per cup.

Each packet of coffee beans would produce 200 cups of coffee and same goes for tea powder packet.
Each cup of tea or coffee would consist of 10g of sugar on an average and 100 ml of milk.
The company anticipate that due to ready availability of tea and coffee through vending machines its employees would end up consuming more tea and coffee. It estimates that the consumption will incr ease by on an average 20% for all class of employees. Also, the paper cups consumption will be 10% more than the actual cups served due to leakages in them.
The company is in the 25% tax bracket and has a current cost of capital at 12% per annum. Straight line method of depreciation is allowed for the purpose of taxation. You as a financial consultant is required to ADVISE on the feasibility of acquiring the vending machine.
PV factors @ 12%:

| Year | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| PVF | 0.8929 | 0.7972 | 0.7118 | 0.6355 | 0.5674 |

**Ans.**

**A. Computation of CFAT (Year 1 to 5)**

| Particulars | | | Amount (₹) |
|---|---|---|---|
| (a) | Savings in existing Tea & Coffee charges | (120 × 10 ×3) + (40 ×15 × 3) + (40 ×10 × 1) x 200 days | 11,60,000 |
| (b) | AMC of machine | | (75,000) |
| (c) | Electricity charges | 500 ×12 ×12 | (72,000) |
| (d) | Coffee Beans | (W.N.) 144 × 90 | (12,960) |
| (e) | Tea Powder | (W.N.) 480 × 70 | (33,600) |
| (f) | Sugar | (W.N.) 1248 × 50 | (62,400) |
| (g) | Milk | (W.N.) 12480 × 50 | (6,24,000) |
| (h) | Paper Cup | (W.N.) 1,37,280 × 0.2 | (27,456) |
| (i) | Depreciation | 10,00,000/5 | (2,00,000) |
| **Profit before Tax** | | | **52,584** |
| **(-) Tax @ 25%** | | | **(13,146)** |
| **Profit after Tax** | | | **39,438** |
| **Depreciation** | | | **2,00,000** |
| **CFAT** | | | **2,39,438** |

**B. Computation of NPV**

| Year | Particulars | CF | PVF @ 12% | PV |
|---|---|---|---|---|
| 0 | Cost of machine | (10,00,00) | 1 | (10,00,000) |
| 1-5 | CFAT | 2,39,438 | 3.6048 | 8,63,126 |

| Net Present Value | (1,36,874) |
|---|---|

Since NPV of the machine is negative, it should not be purchased.

**Working Note:**

Computation of Qty of consumable

No. of Tea Cups = [(120 × 3 × 200 days) + (40 × 1 × 200 days) × 1.2 = 96,000

No. of Coffee cups = 40 × 3 × 200 days × 1.2 = 28,800

No. of coffee beans packet $= \frac{28800}{200}$ = 144

No. of Tea Powder Packets $= \frac{96000}{200}$ = 480

Qty of Sugar $= \frac{(96000 + 28800) X 10g}{1000g}$ = 1248 kgs

Qty of Milk $= \frac{(96000 + 28800) x 100ml}{1000ml}$ = 12,480 litres

No. of paper cups = (96,000 + 28,800) × 1.1 = 1,37,280

**Q.44** Purchase Machine or Not — MTP May 21(2)

City Clap Ltd. is in the business of providing housekeeping services. There is a proposal before the company to purchase a mechanized cleaning system for a sum of Rs. 40 lakhs. The present system of the company is to use manual labour for the cleaning job. You are provided with the following information:

Proposed Mechanized System:

| | |
|---|---|
| Cost of the machine | Rs. 40 lakhs |
| Life of the machine | 7 years |
| Depreciation (on straight line basis) | 15% |
| Operating cost of mechanized system | Rs. 20 lakhs per annum |

Present system (Manual):

| | |
|---|---|
| Manual labour | 350 persons |
| Cost of manual labour | Rs. 15,000 per person per annum |

The company has an after-tax cost of fund at 10% per annum.

The applicable tax rate is 50%.

**Ans.** **Calculation of NPV**

| | (Rs.) | (Rs.) |
|---|---|---|
| Cost of Manual System (Rs. 15,000 x 350) | | 52,50,000 |
| *Less:* Cost of Mechanised System: | | |
| Operating Cost | 20,00,000 | |
| Depreciation (Rs. 40,00,000 x 0.15) | 6,00,000 | 26,00,000 |
| Saving per annum | | 26,50,000 |
| *Less:* Tax (50%) | | 13,25,000 |
| Saving after tax | | 13,25,000 |
| *Add:* Depreciation | | 6,00,000 |
| Cash flow per annum | | 19,25,000 |
| Cumulative PV Factor for 7 years @ 10% | | 4.867 |

| | | |
|---|---|---|
| Present value of cash flow for 7 years | | 93,68,975 |
| *Less:* Cost of the Machine | | 40,00,000 |
| NPV | | 53,68,975 |

The mechanized cleaning system should be purchased since NPV is positive by Rs. 53,68,975.

**Q.45** Purchase Machine or Not | MTP May 21(1)

GG Pat hology Lab Ltd. is using 2D sonography machine which has reached the end of its useful life. The lab is intending to upgrade along with the technology by investing in 3D sonography machine as per the choices preferred by the patients. Following new 3D s onography machine of two different brands with same features is available in the market:

| Brand | Cost of machine (Rs.) | Life of machine (Rs.) | Maintenance Cost (Rs.) | | | SLM Depreciation rate (%) |
|---|---|---|---|---|---|---|
| | | | Year 1-5 | Year 6-10 | Year 11-15 | |
| X | 15,00,000 | 15 | 50,000 | 70,000 | 98,000 | 6 |
| Y | 10,00,000 | 10 | 70,000 | 1,15,000 | - | 6 |

Residual Value of machines shall be dropped by 10% and 40% of Purchase price for Brand X and Y respectively in the first year and thereafter shall be depreciated at the rate mentioned above on the original cost.
Alternatively, the machine of Brand Y can also be taken on rent to be returned back to the owner after use on the following terms and conditions:

- Annual Rent shall be paid in the beginning of each year and for first year it shall be Rs. 2,24,000. Annual Rent for the subsequent 4 years shall be Rs. 2,25,000.
- Annual Rent for the final 5 years shall be Rs. 2,70,000.
- The Rent/Agreement can be terminated by GG Labs by making a payment of Rs. 2,20,000 as penalty. This penalty would be reduced by Rs. 22,000 each year of the period of rental agreement.

You are required to:

(i) ADVISE which brand of 3D sonography machine should be acquired assuming that the use of machine shall be continued for a period of 20 years.

(ii) STATE which of the option is most economical if machine is likely to be used for a period of 5 years? The cost of capital of GG Labs is 12%.

The present value factor of Rs. 1 @ 12% for different years is given as under:

| Year | PVF | Year | PVF |
|---|---|---|---|
| 1 | 0.893 | 9 | 0.361 |
| 2 | 0.797 | 10 | 0.322 |
| 3 | 0.712 | 11 | 0.287 |
| 4 | 0.636 | 12 | 0.257 |
| 5 | 0.567 | 13 | 0.229 |
| 6 | 0.507 | 14 | 0.205 |
| 7 | 0.452 | | 0.183 |
| 8 | 0.404 | 16 | 0.163 |

**Ans.** Since the life span of each machine is different and time span exceeds the useful lives of each modeI, we shall use Equivalent Annual Cost method to decide which brand should be chosen.

**(i) If machine is used for 20 years**

(a) Residual value of machine of brand X
= [Rs. 15,00,000 – (1 - 0.10)] - (Rs. 15,00,000 × 0.06 × 14) = Rs. 90,000

(b) Residual value of machine of brand Y
= [Rs. 10,00,000 – (1 - 0.40)] - (Rs. 10,00,000 × 0.06 × 9) = Rs. 60,000

**Present Value (PV) of cost if machine of brand X is purchased**

| Period | Cash Outflow (Rs.) | PVF @ 12% | PV (Rs.) |
|---|---|---|---|
| 0 | 15,00,000 | 1.000 | 15,00,000 |
| 1-5 | 50,000 | 3.605 | 1,80,250 |
| 6-10 | 70,000 | 2.046 | 1,43,220 |
| 11-15 | 98,000 | 1.161 | 1,13,778 |
| 15 | (90,000) | 0.183 | (16,470) |
| | | | 19,20,778 |

PVAF for 1-15 years = 6.812

Equivalent Annual Cost = $\frac{1920778}{6.812}$ = Rs. 2,81,969.76

**Present Value (PV) of cost if machine of brand Y is purchased**

| Period | Cash Outflow (Rs.) | PVF @ 12% | PV (Rs.) |
|---|---|---|---|
| 0 | 10,00,000 | 1.000 | 10,00,000 |
| 1-5 | 70,000 | 3.605 | 2,52,350 |
| 6-10 | 1,15,000 | 2.046 | 2,35,290 |
| 10 | (60,000) | 0.322 | (19,320) |
| | | | 14,68,320 |

PVAF for 1-10 years = 5.651

Equivalent Annual Cost = $\frac{1468320}{5.651}$ = Rs. 2,59,833.66

**Present Value (PV) of cost if machine of brand Y is taken on rent**

| Period | Cash Outflow (Rs.) | PVF @ 12% | PV (Rs.) |
|---|---|---|---|
| 0 | 2,24,000 | 1.000 | 2,24,000 |
| 1-4 | 2,25,000 | 3.038 | 6,83,550 |
| 5-9 | 2,70,000 | 2.291 | 6,18,570 |
| | | | 15,26,120 |

PVAF for 1-10 years = 5.651

Equivalent Annual Cost = $\frac{1526120}{5.651}$ = Rs. 2,70,061.94

**Decision:** Since Equivalent Annual Cash Outflow is least in case of purchase of Machine of brand Y the same should be purchased.

**(ii) If machine is used for 5 years**

(a) Scrap value of machine of brand X
= [Rs. 15,00,000 – (1 - 0.10)] - (Rs. 15,00,000 × 0.06 × 4) = Rs. 9,90,000

(b) Scrap value of machine of brand Y
= [Rs. 10,00,000 – (1 - 0.40)] - (Rs. 10,00,000 × 0.06 × 4) = Rs. 3,60,000

**Present Value (PV) of cost if machine of brand X is purchased**

| Period | Cash Outflow (Rs.) | PVF @ 12% | PV (Rs.) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 0 | 15,00,000 | 1.000 | 15,00,000 |
| 1-5 | 50,000 | 3.605 | 1,80,250 |
| 5 | (9,90,000) | 0.567 | (5,61,330) |
| | | | 11,18,920 |

**Present Value (PV) of cost if machine of brand Y is purchased**

| Period | Cash Outflow (Rs.) | PVF @ 12% | PV (Rs.) |
|---|---|---|---|
| 0 | 10,00,000 | 1.000 | 10,00,000 |
| 1-5 | 70,000 | 3.605 | 2,52,350 |
| 5 | (3,60,000) | 0.567 | (2,04,120) |
| | | | 10,48,230 |

**Present Value (PV) of cost if machine of brand Y is taken on rent**

| Period | Cash Outflow (Rs.) | PVF @ 12% | PV (Rs.) |
|---|---|---|---|
| 0 | 2,24,000 | 1.000 | 2,24,000 |
| 1-4 | 2,25,000 | 3.038 | 6,83,550 |
| 5 | 1,10,000* | 0.567 | 62,370 |
| | | | 9,69,920 |

* [Rs. 2,20,000 - (Rs. 22,000 × 5) = Rs. 1,10,000]

**Decision:** Since Cash Outflow is least in case of rent of Machine of brand Y the same should be taken on rent.

**Q.46** Replace Machine using NPV | RTP May 22

ABC & Co. is considering whether to replace an existing machine or to spend money on revamping it. ABC & Co. currently pays no taxes. The replacement machine costs ₹ 18,00,000 now and requires maintenance of ₹ 2,00,000 at the end of every year for eight years. At the end of eight years, it would have a salvage value of ₹ 4,00,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value fall each year as follows:

| Year | Maintenance (₹) | Salvage (₹) |
|---|---|---|
| Present | 0 | 8,00,000 |
| 1 | 2,00,000 | 5,00,000 |
| 2 | 4,00,000 | 3,00,000 |
| 3 | 6,00,000 | 2,00,000 |
| 4 | 8,00,000 | 0 |

The opportunity cost of capital for ABC & Co. is 15%.

REQUIRED:

When should the company replace the machine?

The following present value table is given for you:

| Year | Present value of ₹ 1 at 15% discount rate |
|---|---|
| 1 | 0.8696 |
| 2 | 0.7561 |
| 3 | 0.6575 |
| 4 | 0.5718 |
| 5 | 0.4972 |
| 6 | 0.4323 |

| | |
|---|---|
| 7 | 0.3759 |
| 8 | 0.3269 |

**Ans.**

**ABC & Co.**
**Equivalent Annual Cost (EAC) of new machine**

| | | (₹) |
|---|---|---|
| (i) | Cost of new machine now | 18,00,000 |
| | Add: PV of annual repairs @ ₹ 2,00,000 per annum for 8 years (₹ 2,00,000 × 4.4873) | 8,97,460 |
| | | 26,97,460 |
| | *Less:* PV of salvage value at the end of 8 years (₹ 4,00,000×0.3269) | 1,30,760 |
| | | 25,66,700 |
| | Equivalent annual cost (EAC) (₹ 25,66,700/4.4873) | 5,71,992 |

**PV of cost of replacing the old machine in each of 4 years with new machine**

| Scenario | Year | Cash Flow (₹) | PV @ 15% | PV (₹) |
|---|---|---|---|---|
| Replace Immediately | 0 | (5,71,992) | 1.00 | (5,71,992) |
| | 0 | 8,00,000 | 1.00 | 8,00,000 |
| | | | | 2,28,008 |
| Replace in one year | 1 | (5,71,992) | 0.8696 | (4,97,404) |
| | 1 | (2,00,000) | 0.8696 | (1,73,920) |
| | 1 | 5,00,000 | 0.8696 | 4,34,800 |
| | | | | (2,36,524) |
| Replace in two years | 1 | (2,00,000) | 0.8696 | (1,73,920) |
| | 2 | (5,71,992) | 0.7561 | (4,32,483) |
| | 2 | (4,00,000) | 0.7561 | (3,02,440) |
| | 2 | 3,00,000 | 0.7561 | 2,26,830 |
| | | | | (6,82,013) |
| Replace in three years | 1 | (2,00,000) | 0.8696 | (1,73,920) |
| | 2 | (4,00,000) | 0.7561 | (3,02,440) |
| | 3 | (5,71,992) | 0.6575 | (3,76,085) |
| | 3 | (6,00,000) | 0.6575 | (3,94,500) |
| | 3 | 2,00,000 | 0.6575 | 1,31,500 |
| | | | | (11,15,445) |
| Replace in four years | 1 | (2,00,000) | 0.8696 | (1,73,920) |
| | 2 | (4,00,000) | 0.7561 | (3,02,440) |
| | 3 | (6,00,000) | 0.6575 | (3,94,500) |
| | 4 | (5,71,992) | 0.5718 | (3,27,065) |
| | 4 | (8,00,000) | 0.5718 | (4,57,440) |

| | | | | |
|---|---|---|---|---|
| | | | | (16,55,365) |

Advice: The company should replace the old machine immediately because the PV of cost of replacing the old machine with new machine is least.

**Q.47** Replace Machine using NPV | PY May 23

Four years ago, Z Ltd. had purchased a machine of ₹ 4,80,000 having estimated useful life of 8 years with zero salvage value. Depreciation is charged using SLM method over the useful life. The company want to replace this machine with a new machine. Details of new machine are as below:

- Cost of new machine is ₹ 12,00,000, Vendor of this machine is agreed to take old machine at a value of ₹ 2,40,000. Cost of dismantling and removal of old machine will be ₹ 40,000. 80% of net purchase price will be paid on spot and remaining will be paid at the end of one year.
- Depreciation will be charged @ 20% p.a. under WDV method.
- Estimated useful life of new machine is four years and it has salvage value of ₹ 1,00,000 at the end of year four.
- Incremental annual sales revenue is ₹ 12,25,000.
- Contribution margin is 50%.
- Incremental indirect cost (excluding depreciation) is ₹ 1,18,750 per year.
- Additional working capital of ₹ 2,50,000 is required at the beginning of year and ₹ 3,00,000 at the beginning of year three. Working capital at the end of year four will be nil.
- Tax rate is 30%.
- Ignore tax on capital gain.

Z Ltd. will not make any additional investment, if it yields less than 12% Advice, whether existing machine should be replaced or not.

| *Year* | *1* | *2* | *3* | *4* | *5* |
|---|---|---|---|---|---|
| ***PVIF0.12, t*** | *0.893* | *0.797* | *0.712* | *0.636* | *0.567* |

**Ans.** **Working Notes:**

**(i) Calculation of Net Initial Cash Outflow**

| Particulars | ₹ |
|---|---|
| Cost of New Machine | 12,00,000 |
| Less: Sale proceeds of existing machine | 2,00,000 |
| Net Purchase Price | 10,00,000 |
| Paid in year 0 | 8,00,000 |
| Paid in year 1 | 2,00,000 |

**(ii) Calculation of Additional Depreciation**

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | ₹ | ₹ | ₹ | ₹ |
| Opening WDV of machine | 10,00,000 | 8,00,000 | 6,40,000 | 5,12,000 |
| Depreciation on new machine @ 20% | 2,00,000 | 1,60,000 | 1,28,000 | 1,02,400 |
| Closing WDV | 8,00,000 | 6,40,000 | 5,12,000 | 4,09,600 |
| Depreciation on old machine (4,80,000/8) | 60,000 | 60,000 | 60,000 | 60,000 |
| **Incremental depreciation** | **1,40,000** | **1,00,000** | **68,000** | **42,400** |

(iii) **Calculation of Annual Profit before Depreciation and Tax (PBDT)**

| Particulars | Incremental Values (₹) |
|---|---|
| Sales | 12,25,000 |
| Contribution | 6,12,500 |
| Less: Indirect Cost | 1,18,750 |
| Profit before Depreciation and Tax (PBDT) | 4,93,750 |

**Calculation of Incremental NPV**

| Year | PVF @ 12% | PBTD (₹) | Incremental Depreciation (₹) | PBT (₹) | Tax @ 30% (₹) | Cash Inflows (₹) | PV of Cash Inflows (₹) |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) = (4) x 0.30 | (6) = (4) – (5) + (3) | (7) = (6) x (1) |
| 1 | 0.893 | 4,93,750 | 1,40,000 | 3,53,750 | 106,125 | 3,87,625 | 3,46,149.125 |
| 2 | 0.797 | 4,93,750 | 1,00,000 | 3,93,750 | 1,18,125 | 3,75,625 | 2,99,373.125 |
| 3 | 0.712 | 4,93,750 | 68,000 | 4,25,750 | 1,27,725 | 3,66,025 | 2,60,609.800 |
| 4 | 0.636 | 4,93,750 | 42,400 | 4,51,350 | 1,35,405 | 3,58,345 | 2,27,907.420 |
| | | | * | | | * | **11,34,039.470** |
| Add: PV of Salvage (₹ 1,00,000 x 0.636) | | | | | | | 63,600 |
| Less: **Initial Cash Outflow** - Year 0 | | | | | | | **8,00,000** |
| Year 1 (₹ 2,00,000 × 0.893) | | | | | | | **1,78,600** |
| Less: Working Capital - Year 0 | | | | | | | **2,50,000** |
| Year 2 (₹ 3,00,000 × 0.797) | | | | | | | **2,39,100** |
| Add: Working Capital released - Year 4 (₹ 5,50,000 × 0.636) | | | | | | | **3,49,800** |
| Incremental Net Present Value | | | | | | | **79,739.470** |

Since the incremental NPV is positive, existing machine should be replaced.

**Alternative Presentation**

**Computation of Outflow for new Machine:**

| | ₹ |
|---|---|
| Cost of new machine | 12,00,000 |
| Replaced cost of old machine | 2,40,000 |
| Cost of removal | 40,000 |
| **Net Purchase price** | **10,00,000** |
| Outflow at year 0 | 8,00,000 |
| Outflow at year 1 | 2,00,000 |

**Computation of additional deprecation**

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | ₹ | ₹ | ₹ | ₹ |
| Opening WDV of machine | 10,00,000 | 8,00,000 | 6,40,000 | 5,12,000 |
| Depreciation on new machine @ 20% | 2,00,000 | 1,60,000 | 1,28,000 | 1,02,400 |
| Closing WDV | 8,00,000 | 6,40,000 | 5,12,000 | 4,09,600 |
| Depreciation on old machine | 60,000 | 60,000 | 60,000 | 60,000 |

| | | | | |
|---|---|---|---|---|
| (4,80,000/8) | | | | |
| **Incremental depreciation** | **1,40,000** | **1,00,000** | **68,000** | **42,400** |

**Computation of NPV**

| | Year | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| | | ₹ | ₹ | ₹ | ₹ | ₹ |
| 1. | Increase in sales revenue | | 12,25,000 | 12,25,000 | 12,25,000 | 12,25,000 |
| 2. | Contribution | | 6,12,500 | 6,12,500 | 6,12,500 | 6,12,500 |
| 3. | Increase in fixed cost | | 1,18,750 | 1,18,750 | 1,18,750 | 1,18,750 |
| 4. | Incremental Depreciation | | 1,40,000 | 1,00,000 | 68,000 | 42,400 |
| 5. | Net profit before tax [1-(2+3+4)] | | 3,53,750 | 3,93,750 | 4,25,750 | 4,51,350 |
| 6. | Net Profit after tax (5 x 70%) | | 2,47,625 | 2,75,625 | 2,98,025 | 3,15,945 |
| 7. | Add: Incremental depreciation | | 1,40,000 | 1,00,000 | 68,000 | 42,400 |
| 8. | Net Annual cash inflows (6 + 7) | | 3,87,625 | 3,75,625 | 3,66,025 | 3,58,345 |
| 9. | Release of salvage value | | | | | 1,00,000 |
| 10. | (investment)/disinvestment in working capital | (2,50,000) | | (3,00,000) | | 5,50,000 |
| 11. | Initial cost | (8,00,000) | (2,00,000) | | | |
| 12. | Total net cash flows | (10,50,000) | 1,87,625.0 | 75,625 | 3,66,025 | 10,08,345 |
| 13. | Discounting Factor | 1 | 0.893 | 0.797 | 0.712 | 0.636 |
| 14. | Discounted cash flows (12 x 13) | (10,50,000) | 1,67,549.125 | 60,273.125 | 2,60,609.800 | 641307.420 |

**NPV** = (1,67,549 + 60,273 + 2,60,610 + 6,41,307) - 10,50,000 = **₹ 79,739**
Since the NPV is positive, existing machine should be replaced.

**Q.48** Replace Machine using NPV | PY July 21

An exis ting company has a machine which has been in operation for two years, its estimated remaining useful life is 4 years with no residual value in the end. Its current market value is ₹ 3 lakhs. The management is considering a proposal to purchase an improved model of a machine gives increase output. The details are as under:

| *Particulars* | *Existing Machine* | *New Machine* |
|---|---|---|
| *Purchase Price* | *₹ 6,00,000* | *₹ 10,00,000* |
| *Estimated Life* | *6 years* | *4 years* |
| *Residual Value* | *0* | *0* |
| *Annual Operating days* | *300* | *300* |
| *Operating hours per day* | *6* | *6* |
| *Selling price per unit* | *₹ 10* | *₹ 10* |

| | | |
|---|---|---|
| *Material cost per unit* | *₹ 2* | *₹ 2* |
| *Output per hour in units* | *20* | *40* |
| *Labour cost per hour* | *₹ 20* | *₹ 30* |
| *Fixed overhead per annum excluding depreciation* | *₹ 1,00,000* | *₹ 60,000* |
| *Working Capital* | *₹ 1,00,000* | *₹ 2,00,000* |
| *Income-tax rate* | *30%* | *30%* |

Assuming that - cost of capital is 10% and the company uses written down value of depreciation @ 20% and it has several machines in 20% block.

Advice the management on the Replacement of Machine as per the NPV method. The discounting factors table given below:

| *Discounting Factors* | *Year 1* | *Year 2* | *Year 3* | *Year 4* |
|---|---|---|---|---|
| *10%* | *0.909* | *0.826* | *0.751* | *0.683* |

**Ans.**

**(i) Calculation of Net Initial Cash Outflows:**

| **Particulars** | ` |
|---|---|
| Purchase Price of new machine | 10,00,000 |
| *Add:* Net Working Capital | 1,00,000 |
| *Less:* Sale proceeds of existing machine | 3,00,000 |
| Net initial cash outflows | 8,00,000 |

**(ii) Calculation of annual Profit Before Tax and depreciation**

| **Particulars** | **Existing machine** | **New Machine** | **Differential** |
|---|---|---|---|
| **(1)** | **(2)** | **(3)** | **(4) = (3) – (2)** |
| Annual output | 36,000 units | 72,000 units | 36,000 units |
| | ₹ | ₹ | ₹ |
| (A) Sales revenue @ ₹ 10 per unit | 3,60,000 | 7,20,000 | 3,60,000 |
| (B) Cost of Operation | | | |
| Material @ ₹ 2 per unit | 72,000 | 1,44,000 | 72,000 |
| Labour | | | |
| Old = 1,800 × ₹ 20 | 36,000 | | |
| New = 1,800 × ₹ 30 | | 54,000 | 18,000 |
| Fixed overhead excluding depreciation | 1,00,000 | 60,000 | (40,000) |
| Total Cost (B) | 2,08,000 | 2,58,000 | 50,000 |
| **Profit Before Tax and depreciation (PBTD) (A – B)** | **1,52,000** | **4,62,000** | **3,10,000** |

**(iv) Calculation of Net Present value on replacement of machine**

| **Year** | **PBTD** | **Depreciation @ 20% WDV** | **PBT** | **Tax @ 30%** | **PAT** | **Net cash flow** | **PVF @ 10%** | **PV** |
|---|---|---|---|---|---|---|---|---|
| **(1)** | **(2)** | **(3)** | **(4 = 2-3)** | **(5)** | **(6 = 4-5)** | **(7 = 6 + 3)** | **(8)** | **(9 = 7 x 8)** |
| 1 | 3,10,000 | 1,40,000 | 1,70,000 | 51,000 | 1,19,000 | 2,59,000 | 0.909 | 2,35,431.000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 3,10,000 | 1,12,000 | 1,98,000 | 59,400 | 1,38,600 | 2,50,600 | 0.826 | 2,06,995.600 |
| 3 | 3,10,000 | 89,600 | 2,20,400 | 66,120 | 1,54,280 | 2,43,880 | 0.751 | 1,83,153.880 |
| 4 | 3,10,000 | 71,680 | 2,38,320 | 71,496 | 1,66,824 | 2,38,504 | 0.683 | 1,62,898.232 |
| | | | | | | | | **7,88,478.712** |
| **Add:** Release of net working capital at year end 4 (1,00,000 x 0.683) | | | | | | | | 68,300.000 |
| **Less:** Initial Cash Outflow | | | | | | | | 8,00,000.000 |
| **NPV** | | | | | | | | **56,778.712** |

Advice: Since the incremental NPV is positive, existing machine should be replaced.

Working Notes:

1. **Calculation of Annual Output**

Annual output = (Annual operating days x Operating hours per day) x output per hour

Existing machine = (300 x 6) x 20 = 1,800 x 20 = 36,000 units

New machine = (300 x 6) x 40 = 1,800 x 40 = 72,000 units

2. **Base for incremental depreciation**

| **Particulars** | | ₹ |
|---|---|---|
| **WDV of Existing Machine** | | |
| Purchase price of existing machine | | 6,00,000 |
| Less: Depreciation for year 1 | 1,20,000 | |
| Depreciation for Year 2 | 96,000 | 2,16,000 |
| **WDV of Existing Machine (i)** | | **3,84,000** |
| **Depreciation base of New Machine** | | |
| Purchase price of new machine | | 10,00,000 |
| Add: WDV of existing machine | | 3,84,000 |
| Less: Sales value of existing machine | | 3,00,000 |
| **Depreciation base of New Machine (ii)** | | **10,84,000** |
| **Base for incremental depreciation [(ii) – (i)]** | | **7,00,000** |

(Note: The above solution have been done based on incremental approach) Alternatively, solution can be done based on Total Approach as below:

**(i) Calculation of depreciation:**

| **Existing Machine** | | | | | | |
|---|---|---|---|---|---|---|
| | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| **Opening balance** | 6,00,000 | 4,80,000 | 3,84,000 | 3,07,200 | 2,45,760 | 1,96,608.00 |
| **Less: Depreciation @ 20%** | 1,20,000 | 96,000 | 76,800 | 61,440 | 49,152 | 39,321.60 |
| **WDV** | 4,80,000 | 3,84,000 | 3,07,200 | 2,45,760 | 1,96,608 | 1,57,286.40 |

| **New Machine** | | | | |
|---|---|---|---|---|
| | **Year 1** | **Year 2** | **Year 3** | **Year 4** |
| **Opening balance** | **10,84,000*** | 8,67,200 | 6,93,760 | 5,55,008.00 |
| **Less: Depreciation @ 20%** | **2,16,800** | **1,73,440** | **1,38,752** | **1,11,001.60** |

| | | | | |
|---|---|---|---|---|
| **WDV** | 8,67,200 | 6,93,760 | 5,55,008 | 4,44,006.40 |

* As the company has several machines in 20% block, the value of Existing Machine from the block calculated as below shall be added to the new machine of ₹ 10,00,000:

WDV of existing machine at the beginning of the year ₹ 3,84,000
Less: Sale Value of Machine ₹ 3,00,000
WDV of existing machine in the block ₹ 84,000
Therefore, opening balance for depreciation of block = ₹ 10,00,000 + ₹ 84,000 = ₹ 10,84,000

**(ii) Calculation of annual cash inflows from operation:**

| Particulas | EXISTING MACHINE | | | |
|---|---|---|---|---|
| | Year 3 | Year 4 | Year 5 | Year 6 |
| **Annual output (300 operating Days x 6 operating hours x 20 output per hour)** | **36,000 units** | **36,000 units** | **36,000 units** | **36,000 units** |
| | ₹ | ₹ | ₹ | ₹ |
| (A) **Sales revenue @₹10 per unit** | **3,60,000.00** | **3,60,000.00** | **3,60,000.00** | **3,60,000.00** |
| (B) Less: Cost of Operation | | | | |
| Material @ ₹ 2 per unit | 72,000.00 | 72,000.00 | 72,000.00 | 72,000.00 |
| Labour @ ₹ 20 per hour for (300 x 6) hours | 36,000.00 | 36,000.00 | 36,000.00 | 36,000.00 |
| Fixed overhead | 1,00,000.00 | 1,00,000.00 | 1,00,000.00 | 1,00,000.00 |
| Depreciation | 76,800.00 | 61,440.00 | 49,152.00 | 39,321.60 |
| **Total Cost (B)** | **2,84,800.00** | **2,69,440.00** | **2,57,152.00** | **2,47,321.60** |
| Profit Before Tax (A – B) | 75,200.00 | 90,560.00 | 1,02,848.00 | 1,12,678.40 |
| Less: Tax @ 30% | 22,560.00 | 27,168.00 | 30,854.40 | 33,803.52 |
| **Profit After Tax** | **52,640.00** | **63,392.00** | **71,993.60** | **78,874.88** |
| Add: Depreciation | 76,800.00 | 61,440.00 | 49,152.00 | 39,321.60 |
| Capital | | | | 1,00,000.00 |
| **Annual Cash Inflows** | **1,29,440.00** | **1,24,832.00** | **1,21,145.60** | **2,18,196.48** |

| Particulars | NEW MACHINE | | | |
|---|---|---|---|---|
| | Year 1 | Year 2 | Year 3 | Year 4 |
| **Annual output (300 operating days x 6 operating hours x 40 output per hour)** | **72,000 units** | **72,000 units** | **72,000 units** | **72,000 units** |
| | ₹ | ₹ | ₹ | ₹ |
| (A) **Sales revenue @ ₹10 per unit** | **7,20,000.00** | **7,20,000.00** | **7,20,000.00** | **7,20,000.00** |
| (B) Less: Cost of Operation | | | | |
| Material @ ₹ 2 per unit | 1,44,000.00 | 1,44,000.00 | 1,44,000.00 | 1,44,000.00 |
| Labour @ ₹ 30 per hour for (300 x 6) hours | 54,000.00 | 54,000.00 | 54,000.00 | 54,000.00 |
| Fixed overhead | 60,000.00 | 60,000.00 | 60,000.00 | 60,000.00 |

| | | | | |
|---|---|---|---|---|
| Depreciation | 2,16,800.00 | 1,73,440.00 | 1,38,752.00 | 1,11,001.60 |
| **Total Cost (B)** | **4,74,800.00** | **4,31,440.00** | **3,96,752.00** | **3,69,001.60** |
| Profit Before Tax (A – B) | 2,45,200.00 | 2,88,560.00 | 3,23,248.00 | 3,50,998.40 |
| Less: Tax @ 30% | 73,560.00 | 86,568.00 | 96,974.40 | 1,05,299.52 |
| **Profit After Tax** | 1,71,640.00 | 2,01,992.00 | 2,26,273.60 | 2,45,698.88 |
| Add: Depreciation | 2,16,800.00 | 1,73,440.00 | 1,38,752.00 | 1,11,001.60 |
| Add: Release of Working Capital | | | | 2,00,000.00 |
| **Annual Cash Inflows** | **3,88,440.00** | **3,75,432.00** | **3,65,025.60** | **5,56,700.48** |

**(iii) Calculation of Incremental Annual Cash Flow:**

| Particulars | Year 1 (₹) | Year 2 (₹) | Year 3 (₹) | Year 4 (₹) |
|---|---|---|---|---|
| Existing Machine (A) | 1,29,440.00 | 1,24,832.00 | 1,21,145.60 | 2,18,196.48 |
| New Machine (B) | 3,88,440.00 | 3,75,432.00 | 3,65,025.60 | 5,56,700.48 |
| **Incremental Annual Cash Flow (B – A)** | 2,59,000.00 | 2,50,600.00 | 2,43,880.00 | 3,38,504.00 |

**(iv) Calculation of Net Present Value on replacement of machine:**

| Year | Incremental Annual Cash Flow (₹) (A) | Discounting factor @ 10% (B) | Present Value of Incremental Annual Cash Flow (₹) (A x B) |
|---|---|---|---|
| 1 | 2,59,000.00 | 0.909 | 2,35,431.000 |
| 2 | 2,50,600.00 | 0.826 | 2,06,995.600 |
| 3 | 2,43,880.00 | 0.751 | 1,83,153.880 |
| 4 | 3,38,504.00 | 0.683 | 2,31,198.232 |
| **Total Incremental Inflows** | | | **8,56,778.712** |
| Less: Net Initial Cash Outflows (Working note) | | | 8,00,000.000 |
| **Incremental NPV** | | | **56,778.712** |

Advice: Since the incremental NPV is positive, existing machine should be replaced.

Working Note:

**Calculation of Net Initial Cash Outflows:**

| Particulars | ₹ |
|---|---|
| Cost of new machine | 10,00,000 |
| Less: Sale proceeds of existing machine | 3,00,000 |
| Add: incremental working capital required (₹ 2,00,000 – ₹ 1,00,000) | 1,00,000 |
| **Net initial cash outflows** | **8,00,000** |

**Q.49** Replace Machine using NPV | RTP Dec 21

HMR Ltd. is considering replacing a manually operated old machine with a fully automatic new machine. The old machine had been fully depreciated for tax pu rpose but has a book value of ₹ 2,40,000 on 31st March 2021. The machine has begun causing problems with breakdowns and it cannot fetch more than ₹ 30,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹ 1,00,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹ 4,50,000. The expected life of new machine is 10 years with salvage value of ₹ 35,000.

Further, the company follows straight line depreciation method but for tax purpose, written down value method depreciation @ 7.5% is allowed taking that this is the only machine in the block of assets.
Given below are the expected sales and costs from both old and new machine:

| | Old machine (₹) | New machine (₹) |
|---|---|---|
| Sales | 8,10,000 | 8,10,000 |
| Material cost | 1,80,000 | 1,26,250 |
| Labour cost | 1,35,000 | 1,10,000 |
| Variable overhead | 56,250 | 47,500 |
| Fixed overhead | 90,000 | 97,500 |
| Depreciation | 24,000 | 41,500 |
| PBT | 3,24,750 | 3,87,250 |
| Tax @ 30% | 97,425 | 1,16,175 |
| PAT | 2,27,325 | 2,71,075 |

From the above information, ANALYSE whether the old machine should be replaced or not if required rate of return is 10%? Ignore capital gain tax.
PV factors @ 10%:

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| PVF | 0.909 | 0.826 | 0.751 | 0.683 | 0.621 | 0.564 | 0.513 | 0.467 | 0.424 | 0.386 |

**Ans.**

**Workings:**

**1. Calculation of Base for depreciation or Cost of New Machine**

| Particulars | (₹) |
|---|---|
| Purchase price of new machine | 4,50,000 |
| Less: Sale price of old machine | 1,00,000 |
| | **3,50,000** |

**2. Calculation of Profit before tax as per books**

| Particulars | Old machine (₹) | New machine (₹) | Difference (₹) |
|---|---|---|---|
| PBT as per books | 3,24,750 | 3,87,250 | 62,500 |
| Add: Depreciation as per books | 24,000 | 41,500 | 17,500 |
| Profit before tax and depreciation (PBTD) | 3,48,750 | 4,28,750 | 80,000 |

**Calculation of Incremental NPV**

| Year | PVF @ 10% | PBTD (₹) | Dep. @ 7.5% (₹) | PBT (₹) | Tax @ 30% (₹) | Cash Inflows (₹) | PV of Cash Inflows (₹) |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) = (4) x 0.30 | (6) = (4) – (5) + (3) | (7) = (6) x (1) |
| 1 | 0.909 | 80,000.00 | 26,250.00 | 53,750.00 | 16,125.00 | 63,875.00 | 58,062.38 |
| 2 | 0.826 | 80,000.00 | 24,281.25 | 55,718.75 | 16,715.63 | 63,284.38 | 52,272.89 |
| 3 | 0.751 | 80,000.00 | 22,460.16 | 57,539.84 | 17,261.95 | 62,738.05 | 47,116.27 |
| 4 | 0.683 | 80,000.00 | 20,775.64 | 59,224.36 | 17,767.31 | 62,232.69 | 42,504.93 |
| 5 | 0.621 | 80,000.00 | 19,217.47 | 60,782.53 | 18,234.76 | 61,765.24 | 38,356.21 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 0.564 | 80,000.00 | 17,776.16 | 62,223.84 | 18,667.15 | 61,332.85 | 34,591.73 |
| 7 | 0.513 | 80,000.00 | 16,442.95 | 63,557.05 | 19,067.12 | 60,932.88 | 31,258.57 |
| 8 | 0.467 | 80,000.00 | 15,209.73 | 64,790.27 | 19,437.08 | 60,562.92 | 28,282.88 |
| 9 | 0.424 | 80,000.00 | 14,069.00 | 65,931.00 | 19,779.30 | 60,220.70 | 25,533.58 |
| 10 | 0.386 | 80,000.00 | 13,013.82 | 66,986.18 | 20,095.85 | 59,904.15 | 23,123.00 |
| | | | | | | | 3,81,102.44 |
| Add: PV of Salvage value of new machine (₹ 35,000 × 0.386) | | | | | | | 13,510.00 |
| Total PV of incremental cash inflows | | | | | | | 3,94,612.44 |
| Less: Cost of new machine | | | | | | | 3,50,000.00 |
| Incremental Net Present Value | | | | | | | 44,612.44 |

**Analysis:** Since the Incremental NPV is positive, the old machine should be replaced.

**Q.50** Which Finance to choose | RTP Nov 18

XYZ Ltd. requires an equipment costing ₹50,00,000; the same will be utilized over a period of 5 years. It has two financing options in this regard:

(i) Arrangement of a loan of ₹50,00,000 at an interest rate of 14 percent per annum; the loan being repayable in 5 equal year end instalments; the equipment can be sold at the end of fifth year for ₹5,00,000.

(ii) Leasing the equipment for a period of five years at an early rental of ₹16,50,000 payable at the year end. The rate of depreciation is 15 percent on Written Down Value (WDV) basis, income tax rate is 35 percent and discount rate is 12 percent.

ADVISE which of the financing options should XYZ Ltd. exercise and why?

**Ans.**

**Option A**

The loan amount is repayable together with the interest at the rate of 14% on loan amount and is repayable in equal instalments at the end of each year. The PVAF at the rate of 14% for 5 years is 3.432, the amount payable will be

$$\text{Annual Payment} = \frac{5000000}{3.432} = ₹14,56,876$$

**Schedule of Debt Repayment**

| End of year | Total Payment (₹) | Interest (₹) | Principal (₹) | Principal amount outstanding (₹) |
|---|---|---|---|---|
| 1 | 14,56,876 | 7,00,000 | 7,56,876 | 42,43,124 |
| 2 | 14,56,876 | 5,94,037 | 8,62,839 | 33,80,285 |
| 3 | 14,56,876 | 4,73,240 | 9,83,636 | 23,96,649 |
| 4 | 14,56,876 | 3,35,531 | 11,21,345 | 12,75,304 |
| 5 | 14,56,876 | 1,81,572* | 12,75,304 | 0 |

*Balancing Figure

**Schedule of Cash Outflows: Debt Alternative** (Amount in ₹)

| End of year | Debt Payment | Interest | Depreciation | Total | Tax Shield | Cash Outflows | PV factor @12% | Present Value |
|---|---|---|---|---|---|---|---|---|
| 1 | 14,56,876 | 7,00,000 | 7,50,000 | 14,50,000 | 5,07,500 | 9,49,376 | 0.893 | 8,47,793 |
| 2 | 14,56,876 | 5,94,037 | 6,37,500 | 12,31,537 | 4,31,038 | 10,25,838 | 0.797 | 8,17,593 |
| 3 | 14,56,876 | 4,73,240 | 5,41,875 | 10,15,115 | 3,55,290 | 11,01,586 | 0.712 | 7,84,329 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | 14,56,876 | 3,35,531 | 4,60,594 | 7,96,125 | 2,78,644 | 11,78,232 | 0.636 | 7,49,356 |
| 5 | 14,56,876 | 1,81,572 | 3,91,505 | 5,73,077 | 2,00,577 | 12,56,299 | 0.567 | 7,12,322 |
| | | | | | | | | 39,11,393 |
| *Less:* | PV of Salvage | | | | | | | (12,57,904) |
| | | | | | | | | 26,53,489 |

Total present value of Outflows = ₹ 26,53,489

**Option B**

Lease Rent ₹16,50,000
Tax Shield (5,77,500)
Outflow 10,72,500 × 3.605 = ₹38,66,363

Since PV of outflows is lower in the Borrowing option, XYZ Ltd. should avail of the loan and purchase the equipment.