MOCK TEST PAPER – 1

FINAL COURSE: GROUP – II

PAPER – 5: ADVANCED MANAGEMENT ACCOUNTING

SUGGESTED ANSWERS/HINTS

1. (a) Opportunity Cost of Labour - The $G_2$ labour has zero opportunity cost as there is no other use for the time already paid for and is available. However, Mini SIAM needs to pay an additional amount for $G_1$ labour. This amount can be save if the special job were not there.

*$G_1$ labour:*

| | |
|---|---|
| Hours Required | 250 |
| Hours Available | 150 |
| Extra Hours Needed | 100 |
| Cost *per hour* (₹630/42hrs) | ₹ 15 |
| Opportunity Cost | ₹1,500 |

Thus, the 'Opportunity Cost of Labour' for completing the special job is ₹1,500.

Opportunity Cost of Material - Mini SIAM has no alternative use for the $R_1$, they must dispose of it at a cost of ₹1,250. Thus, Mini SIAM actually *saves* ₹1,250 by using the materials for the NIA Industries' special job. Consequently, the 'Opportunity Cost of Material' is - ₹1,250 (i.e., the opportunity cost of this resource is negative).

The *minimum price* is the price at which Mini SIAM just recovers its 'Opportunity Cost. Mini SIAM's 'Total Opportunity Cost' is ₹250 (₹1,500 − ₹1,250). Accordingly, minimum Price for the Special Job is ₹250.

(b) Analysis of WIP Account

| | November | December |
|---|---|---|
| Opening WIP | 36,000 | 55,100 |
| *Add:* Direct Materials Usage | 50,000 | 56,000 |
| *Add:* Direct Labor | 53,100 | 69,000 |
| *Add:* Variable Overhead | 25,000 | 29,000 |
| Total Inflow into WIP | 1,64,100 | 2,09,100 |
| *Less:* Variable Cost of Goods Manufactured | 1,09,000 | 1,14,800 |
| Ending WIP | 55,100 | 94,300 |

Analysis of Finished Goods Inventory Account

| | November | December |
|---|---|---|
| Opening Finished Goods | 44,000 | 30,000 |
| *Add:* Cost of Goods Manufactured | 1,09,000 | 1,14,800 |
| Cost of Goods Available for Sale | 1,53,000 | 1,44,800 |
| *Less:* Cost of Goods Sold | 1,23,000 | 99,800 |
| Ending Finished Goods Inventory | 30,000 | 45,000 |

(c) (i) Cost incurred on Product 'C' *upto point of separation* is irrelevant for decision making as Product 'C' is a Joint Product. Joint Products are the result of same raw material & same process Operations.

Cost incurred *after point of separation* will be considered for decision making as *specifically* incurred for Product 'C'.

After further processing Product 'C' will *contribute* ₹17 per unit toward 'Joint Production Cost'.

Calculation is as follows:

| Particulars | Amount(₹) | Amount(₹) |
|---|---|---|
| Selling Price *per unit* | | 37.00 |
| *Less:* Cost after Separation: | | |
| Marginal Cost *per unit* | 15.00 | |
| Fixed Cost *per unit* | 5.00 | 20.00 |
| Contribution toward 'Joint Production Cost' | | 17.00 |

Hence, *further processing* of Product 'C' is recommended.

(ii) If Product 'C' is not a joint product with same cost structure. In this case there will be *negative contribution* on production of Product 'C'. The calculation is as follows:

| Particulars | Amount(₹) |
|---|---|
| Selling Price *per unit* | 37.00 |
| *Less:* Marginal Cost (₹ 30 + ₹ 15) | 45.00 |
| Contribution | (8.00) |

Hence, production of Product 'C' will not be recommended.

(d) (i) Under the Hungarian Assignment Method, the prerequisite to assign any job is that each row and column must have a zero value in its corresponding cells. If

any row or column does not have any zero value then to obtain zero value, each cell values in the row or column is subtracted by the corresponding minimum cell value of respective rows or columns by performing row or column operation. This means *if any row or column have two or more cells having same minimum value then these row or column will have more than one zero.* However, having two zeros does not necessarily imply two equal values in the original assignment matrix just before row and column operations. *Two zeroes in a same row can also be possible by two different operations i.e. one zero from row operation and one zero from column operation*.

(ii) The order of matrix in the assignment problem is 4 × 4. The total assignment (allocations) will be four. In the assignment problem when any allocation is made in any cell then the corresponding row and column become unavailable for further allocation. Hence, these corresponding row and column are crossed mark to show unavailability. In the given assignment matrix two allocations have been made in $a_{24}$ (2nd row and 4th column) and $a_{32}$ (3rd row and 2nd column). This implies that 2nd and 3rd row and 4th and 2nd column are unavailable for further allocation.

Therefore, the other allocations are at either at $a_{11}$ and $a_{43}$ or at $a_{13}$ and $a_{41}$.

2. (a) Statement Showing Recommended Selling Price

| | 100 Units (per Unit) | | 200 units (per Unit) | |
|---|---|---|---|---|
| Department KTS: | | | | |
| Direct Labour | 36hrs. × ₹3 | 108.00 | 36Hrs. × 0.80 × ₹3 | 86.40 |
| Overtime Premium# | | 0.00 | | 10.80 |
| Total Labour Cost ...(A) | | 108.00 | | 97.20 |
| | | | | |
| Variable Overheads | 36hrs. × ₹ 10 | 360.00 | 36 Hrs. × 0.80 × ₹ 10 | 288.00 |
| Fixed Overheads | 36hrs. × ₹ 11 | 396.00 | 36 Hrs. × 0.80 × ₹11 | 316.80 |
| Total Overheads ...(B) | | 756.00 | | 604.80 |
| | | | | |
| Department KTW: | | | | |
| Direct Labour | 18hrs. × ₹ 2.5 | 45.00 | 18 Hrs. × 0.70 × ₹2.5 | 31.50 |
| Overtime Premium | | 0.00 | | 0.00 |
| Total Labour Cost ...(C) | | 45.00 | | 31.50 |
| | | | | |
| Variable Overheads | 18hrs. × ₹ 6 | 108.00 | 18 Hrs. × 0.70 × ₹6 | 75.60 |

| | | | | |
|---|---|---|---|---|
| Fixed Overheads | 18hrs. × ₹ 7 | 126.00 | 18 Hrs. × 0.70 × ₹7 | 88.20 |
| Total Overheads ...(D) | | 234.00 | | 163.80 |
| | | | | |
| Special Tool ...(E) | ₹ 5,500 / 100 | 55.00 | ₹ 5,500 / 200 | 27.50 |
| | | | | |
| Direct Material ...(F) | | 36.00 | | 32.40 |
| | | | | |
| Profit on Labour (10%) | ₹(108 + 45)× 10% | 15.30 | ₹(97.20 + 31.50)×10% | 12.87 |
| Profit on Overheads (15%) | ₹(756+234) ×15% | 148.50 | ₹(604.80 +163.80) × 15% | 115.29 |
| Total Profit ...(G) | | 163.80 | | 128.16 |
| | | | | |
| Recommended Selling Price [(A)+ (B)+(C) + +(D)+(E)+(F)+(G)] | | 1,397.80 | | 1,085.36 |

(#) Statement Showing Overtime Premium

| | Department KTS | Department KTW |
|---|---|---|
| Direct Labour Hours Available | 12,000 | 8,000 |
| Present workload | 7,680 | 4,200 |
| Balance Direct Labour Hours | 4,320 | 3,800 |
| | | |
| Hours Required to produce 100 units: | 3,600 | 1,800 |
| Hours Required to produce 200 units: | 5,760 (200 x 36 x 0.80) | 2,520 (200 x 18 x 0.70) |
| | | |
| Overtime Required to produce 100 units | --- | --- |
| Overtime Required to produce 200 units | 1,440 Hrs | --- |
| Overtime Premium | 10.8$ per Unit | --- |

($) 1,440 Hrs × 3 × 50% / 200 Units

(b) (i) 'Learning Curve Theory' will not be applicable as *alloy combination of the input metal is quite different* among the suppliers hence learning experience with one

type of metal may not be beneficial for the workers to deal with other metal with separate alloy composition.

(ii) 'Learning Curve Theory' will not be applicable as in this situation *rotation of labour is done frequently*, labours will not be able to get the benefit of learning and apply their learning. Hence, learning curve theory can not be applied.

(iii) 'Learning Curve Theory' will not be applicable as in this situation as *workers are skilled and employed for a long time*, they have already achieved maximum level of expertise by taking advantage of learning. Hence, at this point of time learning curve theory can not be applied.

(iv) 'Learning Curve Theory' will not be applicable as indirect materials are the materials which are not used directly in the production (not directly proportionate with volume of output) and usually used machines (e.g. lubricants, spares parts etc.) with less human interactions. Adverse usage of indirect materials can be controlled through proper monitoring and appropriate standard settings and not from applying learning curve theory.

3. (a)

| $C_j \rightarrow$ | | | 6 | 4 | 10 | 0 | 0 | 0 | Min. Ratio |
|---|---|---|---|---|---|---|---|---|---|
| $C_B$ | Basic Variable | Quantity | $X_1$ | $X_2$ | $X_3$ | $S_1$ | $S_2$ | $S_3$ | |
| 0 | $S_1$ | 400 | 0 | 4/3 | 0 | 1 | -1/3 | 0 | 300 |
| 6 | $X_1$ | 400 | 1 | 2/3 | 2 | 0 | 1/3 | 0 | 600 |
| 0 | $S_3$ | 400 | 0 | 5/3 | 0 | 0 | -2/3 | 1 | ←240 |
| | | $Z_j = \sum C_{Bi}X_j$ | 6 | 4 | 12 | 0 | 2 | 0 | |
| | | $C_j - Z_j$ | 0 | 0↑ | -2 | 0 | -2 | 0 | |

(i) Yes, because the given solution has no artificial variables in the basic column.

(ii) Perform one more iteration with $X_2$:

| $C_j \rightarrow$ | | | 6 | 4 | 10 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|
| $C_B$ | Basic Variable | Quantity | $X_1$ | $X_2$ | $X_3$ | $S_1$ | $S_2$ | $S_3$ |
| 0 | $S_1$ | 80 | 0 | 0 | 0 | 1 | 1/5 | -4/5 |
| 6 | $X_1$ | 240 | 1 | 0 | 2 | 0 | 3/5 | -2/5 |
| 4 | $X_2$ | 240 | 0 | 1 | 0 | 0 | -2/5 | 3/5 |
| | | $Z_j = \sum C_{Bi}X_j$ | 6 | 4 | 12 | 0 | 2 | 0 |
| | | $C_j - Z_j$ | 0 | 0 | -2 | 0 | -2 | 0 |

(iii) Shadow Price is ₹0, ₹2 and ₹0 (or any other given monetary unit) for Constraint

1, Constraint 2 and Constraint 3 respectively and same has been obtained from row $C_j - Z_j$.

(iv) $C_j - Z_j$ for $X_3$ being –2, production of each unit of $X_3$ would cause a reduction of ₹2 (or any other given monetary unit). Thus, the price for $X_3$ should be increased by at least two rupee per unit to ensure no reduction of profits.

(v) Original Constraint Inequality with the coefficient of variables:

Let us consider the given iteration is the 2nd one. The first iteration ($I_1$) must have had $S_2$ instead of $X_1$. Row $X_1$ of $I_2$ has been computed by dividing the $S_2$ row of $I_1$ by 3. $S_2$ of $I_1$ (in Identity Matrix) would have been 1. Now it is 1/3. Working backwards, we multiply row $X_1$ of $I_2$ by 3 to get Row $S_2$ of $I_1$.

Original Row $S_2$ [$X_1$ of $I_2 \times 3$]:

$$(1X_1 + 2/3X_2 + 2X_3) \times 3 \quad \leq \quad 400 \times 3$$

*Or*

$$3X_1 + 2X_2 + 6X_3 \quad \leq \quad 1,200$$

Similarly Original Row $S_1$ [$S_1$ of $I_2$ + $X_1$ of $I_2$]:

$$(0X_1 + 4/3X_2 + 0X_3) + (1X_1 + 2/3X_2 + 2X_3) \quad \leq \quad 400 + 400$$

*Or*

$$X_1 + 2X_2 + 2X_3 \quad \leq \quad 800$$

Similarly Original Row $S_3$ [$S_3$ of $I_2$ + 2 × $X_1$ of $I_2$]:

$$0X_1 + 5/3X_2 + 0X_3 + (1X_1 + 2/3X_2 + 2X_3) \times 2 \quad \leq \quad 400 + 400 \times 2$$

*Or*

$$2X_1 + 3X_2 + 4X_3 \quad \leq \quad 1,200$$

☞ Original Constraint Inequality (with the coefficient of variables) can also be traced through algebraic method by solving through *system of equations*.

(b) Working Note

| Details | Working | Amount (₹) |
|---|---|---|
| Selling Price | ₹4,99,200 / 1,200units | 416 |
| Raw Materials | ₹1,68,000 / 1,400units | 120 |

| | | |
|---|---|---|
| Labour<br><br>**Equivalent units (1,400 units / 80%)* | ₹1,05,000 / 1,750units * | 60 |
| Variable Overheads | ₹42,000 / 1,400units | 30 |
| Manufacturing Cost (Variable)<br>[₹120 + ₹60 + ₹30] | | 210 |
| Distribution Overheads | ₹19,200 / 1,200units | 16 |
| Total Variable Cost [₹210 + ₹16] | | 226 |
| Contribution [₹416 - ₹226] | | 190 |
| Fixed Cost | | |
| Factory | ₹ 1,20,000 | |
| Administration | ₹ 40,000 | |
| Selling | ₹ 40,000 | 2,00,000 |

Standard Profit for 1,200 Units Sold

| Details | Working | Amount (₹) |
|---|---|---|
| Contribution | 1,200 units × ₹ 190 | 2,28,000 |
| *Less*: Fixed Costs | | 2,00,000 |
| Profit | | 28,000 |

Reconciliation between Budgeted and Actual Profit

| Details | Working | Amount (₹) |
|---|---|---|
| Budgeted Profit | (2,000 units × ₹ 190 – ₹ 2,00,000) | 1,80,000 |
| *Less*: Volume variance | (800 units× ₹190) | 1,52,000 |
| Standard Profit | | 28,000 |
| *Factors causing loss*: | | |
| Units Scrapped | (100 units × ₹210) | 21,000 |
| Labour Inefficiency | (350 units × ₹60) | 21,000 |
| Undervaluation of Closing Stock | {100 units × (₹210 – ₹180)} | 3,000 |
| Actual Profit | | (-)17,000 |

4. (a) Statement Showing 'Customer Profitability Analysis'

| Particulars | $V_1$ | $V_2$ | Channel Total | $V_3$ | $V_4$ | Channel Total |
|---|---|---|---|---|---|---|
| | Small Stores | | | Large Stores | | |
| Revenue at List Price | 1,60,000 | 1,80,000 | 3,40,000 | 25,50,000 | 12,00,000 | 37,50,000 |
| Discount | 8,000 | 18,000 | 26,000 | 4,59,000 | 1,44,000 | 6,03,000 |
| Net Revenue | 152,000 | 1,62,000 | 3,14,000 | 20,91,000 | 10,56,000 | 31,47,000 |
| Variable Costs | 1,28,000 | 1,44,000 | 2,72,000 | 20,40,000 | 9,60,000 | 30,00,000 |
| Contribution Margin | 24,000 | 18,000 | 42,000 | 51,000 | 96,000 | 1,47,000 |
| Order Processing | 3,000 | 6,750 | 9,750 | 4,500 | 2,250 | 6,750 |
| Regular Deliveries | 1,500 | 3,375 | 4,875 | 2,250 | 1,125 | 3,375 |
| Expedited Deliveries | 2,500 | --- | 2,500 | 2,500 | --- | 2,500 |
| Customer Profit | 17,000 | 7,875 | 24,875 | 41,750 | 92,625 | 1,34,375 |
| Channel Cost | | | 20,250 | | | 48,375 |
| Channel Profit | | | 4,625 | | | 86,000 |

Suggestions

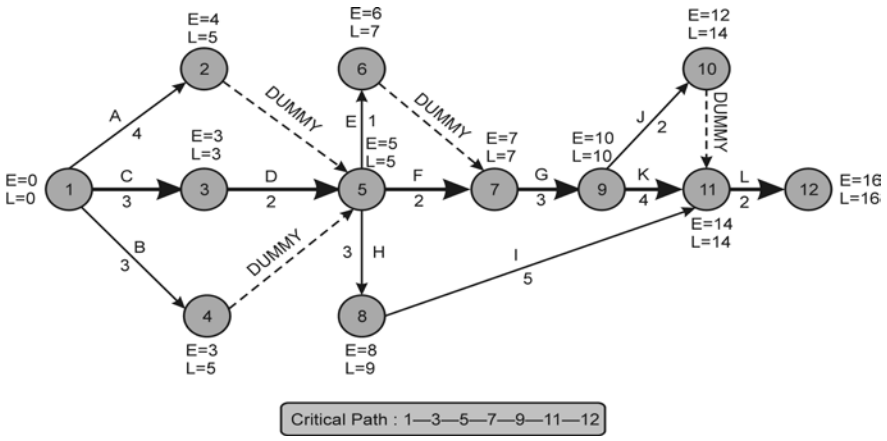
VMCC is only just at breakeven point with small pharmaceuticals. To improve profit VMCC should:

(i) Coordinate with $V_2$ to *increase order size* and try to *negotiate a smaller discount*.

(ii) Try to work with $V_1$ to *reduce number of expedited deliveries*.

VMCC makes substantial profit from the large pharmaceuticals. VMCC may give *little extra attention* on $V_4$ as $V_4$ is most favorable customer and its order is for large quantities. For $V_3$, VMCC may have *no options* as $V_3$ accounts more than 50% of Sales.

(b) (i) The network for the given problem:




(ii) The critical path is 1–3–5–7–9–11–12 i.e. C–D–F–G–K–L with total project duration of 16 weeks.

(iii) Overtime working to get the frame designed in only 3 weeks instead of 4 weeks will not reduce the project duration to 15 weeks *since A is not a critical activity*.

If more designers are assigned to design the gears, the duration of activity C will be reduced. *As activity C is a critical activity*.

The designers may be taken away from activity A or activity B, since activity A can be delayed by one week and activity B by two weeks without delaying the total project duration.

5. (a) <u>Working Notes</u>

(1) Single and Double Rooms Occupancy:

| | |
|---|---|
| Single Rooms Occupancy Days (180 Rooms × 365 Days × 85%) | 55,845 |
| Double Rooms Occupancy Days (60 Rooms × 365 Days × 85%) | 18,615 |

(2) Total Variable Cost of Single and Double Rooms Occupancy Days:

| | |
|---|---|
| Variable Cost of Single Rooms Occupancy Days (55,845 × ₹300) | ₹1,67,53,500 |
| Variable Cost of Double Rooms Occupancy Days (18,615 × ₹500) | ₹93,07,500 |
| Total Variable Costs | ₹2,60,61,000 |

(3) Total Fixed Cost of Single and Double Rooms Days:

| | |
|---|---|
| Fixed Cost of Single Rooms Days (55,845 × ₹500) | ₹2,79,22,500 |
| Fixed Cost of Double Rooms Days (18,615 × ₹780) | ₹1,45,19,700 |
| Total Fixed Costs | ₹4,24,42,200 |

(4) Computation of Total Desired Revenue of the Hotel:

Since the Margin of Safety in 20% therefore Break-even Point is 80%

Hence the Total Desired Revenue $\left(\frac{₹2,60,61,000 + ₹4,24,42,200}{0.8}\right)$ ₹8,56,29,000

(5) Computation of Notional Single Room Occupancy Days:

The rent of each double room is 160% of the rent of the single room. To facilitate the task of determining the room rent of a double room per day, we convert the double room occupancy days as follows:

| | |
|---|---|
| Double Room Occupancy Days | 18,615 |
| Notional Single Room Occupancy Days (18,615 × 1.6) | 29,784 |
| *Add:* Single Room Occupancy Days | 55,845 |
| Total Notional Single Room Occupancy Days | 85,629 |

(i) Computation of Tariff *per day*

| | |
|---|---|
| Total Desired Revenue (W.N.-4) (₹) | 8,56,29,000 |
| Total Notional Single Room Occupancy Days (W.N.-5) | 85,629 |
| Rent *per notional single room day* (₹) | 1,000 |
| Double Room Rent (₹1,000 × 1.6) | 1,600 |
| Tariff *per day* for Single Room (100/80 × ₹1,000) (₹) | 1,250 |
| Tariff *per day* for Double Room (100/80 × ₹1,600) (₹) | 2,000 |

(ii) Computation of Increase in the Occupancy Days of the Remaining Single Rooms, so as to Compensate 10% Discount on the Rent Given to a Valued Corporate Customer:

| | |
|---|---|
| No. of Single Rooms Reserved for Valued Corporate Customer | 12 |
| Occupancy Days for Reserved Rooms (12 Rooms × 365 Days × 85%) | 3,723 |
| Discount Given on the Room Rent *per day* (10% × ₹1,000) | ₹ 100 |
| Total Amount of Revenue Lost *due to discount* (3,723 Occupancy Days × ₹ 100) | ₹ 3,72,300 |
| Contribution *per day* on a Single Room (₹1,000 − ₹300) | ₹700 |
| Increase in the Occupancy Days Required *in respect of* Single Rooms (₹3,72,300 / ₹700) | 531.86 *Or* 532 Days |

(b) The MRP system decides the demand for materials, components and sub assemblies at each stage of production. Once the scheduled production starts, the output of each department is pushed through the MRP system to the next department. From the data input, the MRP system knows:

(i) What it is expected to produce (through the MPS file)?

(ii) How it should produce it (through the BOM file)? and with

(iii) What it has to produce it (through the inventory records file)?

This programme starts with the finished goods demand (from the MRPs) and converts the demand requirements backward in time to schedule the desired production of the finished goods from raw materials and component parts with 'time phased' adjustments for lead time requirements. This process is called *'Requirements Explosion'*.

6. (a) To overcome the *optimum decision making* and *performance evaluation conflicts* that can occur with *marginal cost-based transfer pricing* following methods has been proposed:

Dual Rate Transfer Pricing System

*"With a 'Dual Rate Transfer Pricing System' the 'Receiving Division' is charged with marginal cost of the intermediate product and 'Supplying Division' is credited with full cost per unit plus a profit margin".*

Accordingly Division 'Dx' should be allowed to record the transactions at *full cost per unit* plus *a profit margin*. On the other hand Division 'Dz' may be charged only *marginal cost*. Any inter divisional profits can be eliminated by accounting adjustment.

Impact:

- Division 'Dx' will earn a profit on inter Division transfers.
- Division 'Dz' can chose the output level at which the marginal cost of the product 'X' is equal to the net marginal revenue of the product 'Z'.

Two Part Transfer Pricing System:

*"The 'Two Part Transfer Pricing System' involves transfers being made at the marginal cost per unit of output of the supplying Division plus a lump-sum fixed fee charged by the supplying Division to the receiving Division for the use of the capacity allocated to the intermediate product."*

Accordingly Division 'Dx' can transfer its products to Division 'Dz' at *marginal cost per unit* and *a lump-sum fixed fee*.

Impact:

- 'Two Part Transfer Pricing System' will inspire the Division 'Dz' to choose the optimal output level.

- This pricing system also enable the Division 'Dx' to obtain a profit on inter Division transfer.

(b) Cost is not only criterion for deciding in the favour of shut down. Non-cost factors worthy of consideration in this regard are as follows:

(i) Interest of workers, if the workers are discharged, it may become difficult to get skilled workers later, on reopening of the factory. Also shut-down may create problems.

(ii) In the face of competition it may difficult to re-establish the market for the product.

(iii) Plant may become obsolete or depreciate at a faster rate or get rusted. Thus, heavy capital expenditure may have to be incurred on re-opening.

(c) Both Standard Costing and Kaizen Costing are helpful and used for *measurement of performance of a company* but there are differences in approach between the two systems.

Under Standard Costing system standards of all important variables like cost and quantity of materials, labours and overheads are set at the beginning of the year or activity. These set standards are compared with the actual performance to analyse the variances. As a step further all variances are classified as planning and operational variances to distinguish variances that are within the manager's control and beyond their effort. In brief Standard Costing and Variance Analysis helps in determine the variances and *take post event measures to stop recurrences*.

On the other hand Kaizen Costing *emphasises on continual improvement*. Targets once set at the beginning of the year or activities are updated continuously to reflect the improvement that has already been achieved and that are yet to be achieved.

As a continuous improvement measure Kaizen Costing set new challenges before the workers and managers and helps to improve and control the situation to achieve desired target results. Therefore, if Kaizen costing is used in place of Standard Costing and Variance analysis to measure performance then definitely it will keep Arnav Automobile Ltd. competent enough to head on with the global automobile players.

7. (a) Target cost is the difference between the estimated selling price of a proposed product with specified functionality and quality and target margin. This is a cost management technique that aims to produce and sell products that will ensure the target margin. It is an integral part of the product design. While designing the product the company allocates value and cost to different attributes and quality. Therefore, they use the technique of value engineering and value analysis. The target cost is achieved by assigning cost reduction targets to different operations that are involved in the production process. Eventually, all operations do not achieve the cost reduction targets, but the overall cost reduction target is achieved through team work. Therefore, it is said that target costing fosters team work.

(b) The following qualitative factors should be considered in an outsourcing decision:

(i) Whether the vendor will acquire the technology and will emerge as a competitor?

(ii) Whether the vendor will be able to maintain the quality? If the vendor fails to maintain the quality, will the company lose customers?

(iii) Whether the company will lose its skills in manufacturing the product and it will find difficult to resume production internally?

(iv) Whether laying off employees will demoralize the work force?

(v) Whether the price quoted by the vendor is a penetrating price? If so, it is likely to increase i.e. Whether price will increase.

(c) Sunk costs are costs that have been created by a decision made in the past and that cannot be changed by any decision that will be made in the future.

Example, the written down value of assets previously purchased are sunk cost. Sunk costs are not relevant for decision making because they are past cost.

But not all irrelevant costs are sunk cost. For example, a comparison of two alternative production methods may result in identical material costs for both the alternatives. In this case, the direct material cost will remain the same whichever alternative in chosen. In this situation, through direct material cost is the future cost to be incurred in accordance with the production, it is irrelevant, but it is not a sunk cost.

Irrelevant is only with respect to alternatives being considered and not for fund flows whereas for sunk cost there is no further cash flow. Cash flows have already been incurred.

(d) Characteristic of the dual problem:

(i) For any linear programming model called primal model, there exists a companion model called the dual model.

(ii) The number of constraints in the primal model equals the number of variables in the dual model.

(iii) The number of variables in the primal model equals the number of constraints in the dual model

(iv) If the primal model has a maximization objective then the dual model will have a minimization objective and vice-versa. Inequalities get reversed.

(v) The solution of the primal model yields the solution of the dual model. Also, an optimal simplex table for the dual model yields the optimal solution to the primal model. Further, the objective functions of the two optimal tables will have identical values.

(vi) Dual of the dual problem is the original primal itself.

(vii) Feasible solutions to a primal and dual problem are both optimal if the complementary slackness conditions hold. If this relationship does not hold either the primal solution or the dual solution or both are not optimal.

(viii) If the primal problem has no optimal solution due to infeasibility, then the dual problem will have no optimal solution due to unboundedness.

(ix) If primal has no optimal solution due to unboundedness, than the dual will have no optimal solution due to infeasibility.

(e) Synchronous Manufacturing: In an all-encompassing management philosophy which includes a set of principles, procedures and techniques where every action is evaluated in terms of common goals of the organization.

The seven principles are:

(i) Focus on synchronizing the production flow than on idle capacities.

(ii) Value of time at a bottleneck resource is equal to the throughput rate of products processed by the bottleneck.

(iii) Value of time at a non-bottleneck resource is negligible.

(iv) Level of utilization of a non-bottleneck resource is controlled by other constraints within the system.

(v) Resources must be utilized, not simply activated.

(vi) Transfer batch should not be equal to process batch.

(vii) A process batch should be variable both along its route and overtime.