C.A Final- Paper No.-5

Strategic Cost & Management performance

Question 1:

Livewell Limited is a manufacturing company that produces a wide range of consumer products for home consumption. Among the popular products are its energy efficient and environment friendly LED lamps. The company has a quality control department that monitors the quality of production.

As per the recent cost of poor quality report, the current rejection rate for LED lamps is 5% of units input. 5,000 units of input go through the process each day. Each unit that is rejected results in a

₹ 200 loss to the company. The quality control department has proposed few changes to the inspection process that would enable early detection of defects. This would reduce the overall rejection rate from 5% to 3% of units input. The improved inspection process would cost the company ₹ 15,000 each day.

Required

(i) ANALYSE the proposal and suggest if it would be beneficial for the company to implement it.

(ii) After implementation, ANALYSE the maximum rejection rate beyond which the proposal ceases to be beneficial?

Solution:-

(i) Analysis of the proposal to make changes to the inspection process:

The company wants to reduce the cost of poor quality on account of rejected items from the process. The current rejection rate is 5% that is proposed to be improved to 3% of units input.

The expected benefit to the company can be worked out as follows:

The units of input each day = 5,000. At the current rate of 5%, 250 units of input are rejected each day. It is proposed to reduce rejection rate to 3%, that is 150 units of input rejected each day. Therefore, improvements to the inspection process would reduce the number of units rejected by 100 units each day. The resultant cost of poor quality would reduce by

₹ 20,000 each day (100 units of input × ₹ 200 cost of one rejected unit).

The cost of implementing these additional controls to the inspection process would be

₹ 15,000 each day.

The net benefit to the company on implementing the proposal would be ₹ 5,000 each day. Therefore, the company should implement the proposal.

(ii) Analysis of maximum rejection rate beyond which the proposal ceases to be beneficial

The cost of improving controls to the inspection process is ₹ 15,000 each day. The number of units of input processed each day is 5,000. The cost of rejection is ₹ 200 per unit.

It makes sense to implement the improvements to controls only if the benefit is greater than the cost involved. To find out the point where the benefits equal the cost, solve the following equation

Let the number of reduction in rejections each day due to improved controls be R. At ₹ 200 per unit, benefits from reduction in rejection would be ₹ 200 × R.

At what point, would this be equal to the cost of control of ₹ 15,000 per day?

Solving ₹ 200 × R = ₹ 15,000; R = 75 units. That is if the improvements to inspection process control reduces the number of rejections by 75 units each day, the benefit to the company would be ₹ 15,000 each day.

That is if the rejection rate improves by 1.5% (75 units / 5,000 units) then the benefits accruing to the company will equal the cost incurred.

In other words, when the rejection rate is 3.5% (current rate 5% - improvement of 1.5% to the rate) or below, the proposal will be beneficial. In this range, the savings to the cost of poor quality will be more than the cost involved. For example, as explained above, when the improved rejection rate is 3%, the net benefit to the company is ₹ 5,000 each day.

Beyond 3.5% rejection rate, the proposal will result in savings to the cost of poor quality that is less than the cost involved of ₹ 15,000 each day.

Question 2:

JK Ltd. produces and sells a single product. Presently the company is having its quality control system in a small way at an annual external failure and internal failure costs of ₹ 4,40,000 and

₹ 8,50,000 respectively. As the company is not able to ensure supply of good quality products upto the expectations of its customers and wants to manage competition to retain market share considers an alternative quality control system. It is expected that the implementation of the system annually will lead to a prevention cost of ₹ 5,60,000 and an appraisal cost of ₹ 70,000. The external and internal failure costs will reduce by ₹ 1,00,000 and ₹ 4,10,000 respectively in the new system. All other activities and costs will remain unchanged.

Required

I. EXAMINE the new quality control proposal and recommend the acceptance or otherwise of the proposal both from financial and non-financial perspectives.

II. What is your ADVICE to the company, if the company wants to achieve zero defect through a continuous quality improvement programme?

III. SUGGEST a suitable quality control level at a minimum cost.

Solution

(i) Implementation of new system will reduce costs of the non - conformance (internal and external failure) by ₹ 5,10,000 (-40%). However, this will also increase costs of conformance by ₹ 6,30,000. There is inverse relationship between the costs of the conformance and the costs of non-conformance. JK Ltd. should try to avoid costs of non- conformance because both internal and external failure affect customer's satisfaction and organisations profitability. The company should focus on preventing the error such that it ensures that product is of good quality when it reaches the customer at the very first instance. This enhances the customer experience and therefore eliminating the scope for external failures like sales returns and warranty claims. Better quality can yield further sales. Therefore, an increase in spending on quality measures is justified since it not only yields significant improvements to quality but also brings in more sales orders.

Accordingly, from the financial perspective point of view the new proposal for quality control should not be accepted as it will lead to an additional cost of ₹ 1,20,000 (₹ 6,30,000 - ₹ 5,10,000). However, from non-financial perspective point of view as stated above the company should accept the new proposal.

(ii) It is possible to increase quality while at the same time reducing both conformance and non-conformance costs if a programme of aiming for zero defect/ and or continuous improvement

is followed. Zero defect advocates continuous improvement. To implement this elimination of all forms of waste, including reworks, yield losses, unproductive time, over-design, inventory, idle facilities, safety accidents, etc. is necessary.

(iii)   To achieve 0% defects, costs of conformance must be high. As a greater proportion of defects are accepted, however, these costs can be reduced. At a level of 0% defects, cost of non-conformance should be nil but these will increase as the accepted level of defects rises. There should therefore be an acceptable level of defects at which the total costs of quality are at a minimum.

Question 3:

H. Ltd. manufactures three products. The material cost, selling price and bottleneck resource details per unit are as follows:

Particulars	Product X	Product Y	Product Z
Selling Price (₹)	66	75	90
Material and Other Variable Cost (₹)	24	30	40
Bottleneck Resource Time (Minutes)	15	15	20

Budgeted factory costs for the period are ₹ 2,21,600. The bottleneck resources time available is 75,120 minutes per period.

Required

I.   Company adopted throughput accounting and products are ranked according to 'product return per minute'. Select the highest rank product.

II.   CALCULATE throughput accounting ratio and COMMENT on it.

Solution

(i)   **Calculation of Rank According to 'Product Return per minute'**

Particulars	X	Y	Z
Selling Price	66	75	90
Variable Cost	24	30	40
Throughput Contribution	42	45	50
Minutes per unit	15	15	20
Contribution per minute	2.8	3	2.5
Ranking	II	I	III

(ii)   **Ranking Based on 'TA Ratio'**

Contribution per minute	2.80	3.00	2.50
Factory Cost per minute (2,21,600 / 75,120)	2.95	2.95	2.95
TA Ratio (Cont. per minute / Cost per minute)	0.95	1.02	0.85
Ranking Based on TA Ratio	II	I	III

Comment

Product Y yields more contribution compared to average factory contribution per minute, whereas X and Z yield less.

Question 4:

EKS Ltd. manufactures a single product, which requires three components. The company purchases one of the components from three suppliers. DE Ltd., PE Ltd. and ZE Ltd. The following information are available

	DE Ltd.	PE Ltd.	ZE Ltd.
Price quoted by supplier (per hundred units)	₹ 240	₹ 234	₹ 260
% of Defective of total receipts	3%	5%	2%

If the defectives are not detected they are utilized in production causing a damage of ₹ 200 per 100 units of the component. Total requirements are 12,000 units of the components.

The company intends to introduce a system of inspection for the components on receipt. The inspection cost is estimated at ₹ 26 per 100 units of the components. Such as inspection will be able to detect only 90% of the defective components received. No payment will be made for components found to be defective in inspection.

Required

I.   ADVICE whether inspection at the point of receipt is justified?

II.   Which of the three suppliers should be asked to supply?

Solution:-

A: Statement Showing Computation of Effective Cost before Inspection

Particulars	DE Ltd.	PE Ltd.	ZE Ltd.
Units Supplies (No.s)	12,000	12,000	12,000
Defectives Expected (No.s)	360	600	240
Costs:			
Purchase of Components	28,800	28,080	31,200
Add: Production Damage on Defective Components (@ ₹ 200 per 100 components)	720	1,200	480
Total	29,520	29,280	31,680
Good Components (Nos.)	11,640	11,400	11,760
Cost per 100 Good Components	253.61	256.84	269.39

B: Statement Showing Computation of Effective Cost after Inspection

Particulars	DE Ltd.	PE Ltd.	ZE Ltd.
Units Supplies (No.s)	12,000	12,000	12,000
Defects Not Expected (No.s)	36	60	24
Defectives Expected (No.s)	324	540	216
Components Paid For	11,676	11,460	11,784
Costs:			
Purchase of Components	28,022.40	26,816.40	30,638.40
Add: Inspection Cost	3,120.00	3,120.00	3,120.00

Add: Production Damage on Defective Components (@ ₹ 200 per 100 components)	72.00	120.00	48.00
Total	31,214.40	30,056.40	33,806.40
Good Components (Nos.)	11,640	11,400	11,760
Cost per 100 Good Components	268.16	263.65	287.47

Advice Whether Inspection at the Point of Receipt is Justified

(i) On comparing the cost under situation, A and B shown above, we find that it will not be economical to install a system of inspection.

Further we also need to consider that presently many organizations are undergoing Just in Time (JIT) implementation. JIT aims to find a way of working and managing to eliminate wastes in a process. Achievement of this is ensured through eliminating the need to perform incoming inspection. Inspection does not reduce the number of defects, it does not help in improving quality. In general inspection, does not add value to the product. It simply serves as a means of identifying defects the supplier has failed to recognize subsequent to the manufacturing of the product.

As a matter of fact, organizations implementing JIT are seeking eventually to eliminate the need for performing incoming inspection activities through a combination of reducing the supplier base, selection through qualification and vendor development. Vendor development and its proper management seeks to assist the supplier who maintains an interest in striving to provide 100% defect-free materials and parts.

So, to decision whether inspection at the point of receipt is justified or not will also depend on Qualitative factors as well.

(ii) On comparing the buying cost of components under different situations, as analysed and advised above, if company decides not to install a system of inspection, supplier DE would be cheaper otherwise supplier PE would be cheaper and company may choose supplier accordingly.

Question 5:

H Automobile Group is among top 20 business houses in India. It has been founded in the year 1930, at the height of India's movement for independence from the British, the group has an illustrious history. H's footprint stretches over a wide range of industries, spanning automobiles (two wheelers manufacturer and three wheelers manufacturer). H's headquarter is located at Hyderabad. Bike Production is one of segment of H Group. Management of H wants to analyse the following actual information for the April:

Cost Data

Customer Complaints Centre Cost	35 per hr.
Equipment Testing Cost	18 per hr.
Warranty Repair Cost	1,560 per bike
Manufacturing Rework Cost	228 per bike

Volume and Activity Data

Bikes Requiring Manufacturing Rework	3,200 bikes
Bikes Requiring Warranty Repair	2,600 bikes
Production Line Equipment Testing Time	1,600 hrs.

Customer Complaints Centre Time	2,000 hrs.

Additional Information

Due to the quality issues in the month, the bike production line experienced unproductive 'down time' which cost ₹ 7,70,000. H carried out a quality review of its existing suppliers to enhance quality levels during the month at a cost of ₹ 1,25,000.

Required

I.   PREPARE a statement showing 'Total Quality Costs'.

II.   ADVISE any TWO measures to reduce the non- conformance cost.

Solution:-

1:- Statement Showing 'Total Quality Costs'

Particulars of Costs	₹
Prevention Costs	
Supplier Review	1,25,000
Appraisal Costs	
Equipment Testing (₹ 18 × 1,600 hrs.)	28,800
Internal Failure Costs	
Down Time	7,70,000
Manufacturing Rework (₹ 228 × 3,200 bikes)	7,29,600
External Failure Costs	
Customer Complaints (₹ 35 × 2,000 hrs.)	70,000
Warranty Repair (₹ 1,560 × 2,600 bikes)	40,56,000
Total Quality Costs	57,79,400

(ii) The reporting of quality costs highlights the cost of quality activities at H. The total quality costs statement clearly displays the relationship between conformance costs (prevention and appraisal costs) and non-conformance costs (internal failure and external failure costs) and the drivers of a reduction in the overall spending on quality. Statement indicates that only 2.16% of the total quality cost is the cost of preventing quality problems while 0.50% is the cost of appraisal activities. Thus, prevention and appraisal costs make up only 2.66% of total quality costs. In contrast, 97.34% of quality control costs are incurred for internal and external failure costs. Following two measures can be used to reduce non- conformance cost:

Total Productive Maintenance (TPM) is a system of maintaining and improving the integrity of production and quality system through keeping all equipment in top working condition so as to avoid breakdowns and delays in manufacturing processes. It involves identifying machines in every division (including planning, manufacturing, maintenance) and then planning & executing a maintenance programme covering their entire useful life.

In this scenario, TPM will help in reducing internal failure cost (i.e. downtime and manufacturing rework cost), which constitutes 25.95% of total quality cost, by keeping all equipment in good working conditions so that there is no downtime or machine breakdown and ensuring that all equipment run smoothly. If machines work properly, the chances of rework will reduce, ultimately will also reduce chances of warranty repair and customer complaints (comprising 71.39% of total quality cost which is the major part of total quality cost).

Total Quality Management (TQM) aims at improving the quality of organisational output, including goods and services, through continual improvement of internal practices. Its objective is to eradicate waste and increase efficiency without compromising with the quality. It requires that company maintain this quality standards in all aspects of business by ensuring that things are done right the first time so that defects and waste are eliminated from operation.

It appears that H is not a TQM company at present due to huge disparity between conformance costs and non-conformance costs. In order to make H to be successful, all staff at H must be engaged in the improvement process and share in the continuous improvement ethos. In order to establish a reputation as a high- quality bike manufacturer H must ensure staff are focused on quality and attitudes changed toward the importance of conformance activities, for instance, H can conduct third party inspection of raw material at supplier's workplace leading to maintenances of quality standards.

Overall, while applying above two measures, in the H, consideration must therefore be given to the optimum balance between the costs of conformance and the costs of non- conformance.

Question 6:–

Cool Air Private Ltd. manufactures electronic components for cars. Car manufacturers are the primary customers of these products. Raw material components are bought, assembled and the electronic car components are sold to the customers.

The market demand for these components is 5,00,000 units per annum. Cool Air has a market share of 100,000 units per annum (20% market share) for its products. Below are some of the details relating to the product:

Selling price	₹ 2,500 per unit
Raw material cost	₹ 900 per unit
Assembly & machine cost	₹ 500 per unit
Delivery cost	₹ 100 per unit
Contribution	₹ 1,000 per unit

The customers due to defects in the product return 5,000 units each year. They are replaced free of charge by Cool Air. The replaced components cannot be repaired and do not have any scrap value. If these defective components had not been supplied, that is had the sale returns due to defective units been nil, customers' perception about the quality of the product would improve. This could yield 10% increase in market share for Cool Air, that is demand for its products could increase to 1,50,000 units per annum.

Required

ANALYZE, the cost of poor quality per annum due to supply of defective items to the customers.

1. The company management is considering a proposal to implement an inspection process immediately before delivery of products to the customers. This would ensure nil sales returns. The cost of having such a facility would be ₹ 2 crores per annum, this would include materials and equipment for quality check, overheads and utilities, salaries to quality control inspectors etc. ANALYZE the net benefit, if any, to the company if it implements this proposal.

2. Quality control investigations reveal that defective production is entirely on account of inferior quality raw material components procured from a large base of 30 suppliers. Currently there is

no inspection at the procurement stage to check the quality of these materials. The management has a proposal to have inspectors check the quality control at the procurement stage itself. Any defective raw material component will be replaced free of cost by the supplier. This will ensure that no product produced by Cool Air is defective. The cost of inspection for quality control (materials, equipment, salaries of inspectors etc.) would be ₹ 4 crores per annum. ANALYZE the net benefit to the company if it implements this proposal? Please note that scenarios in questions (ii) and are independent and not related to each other.

3. Between inspection at the end of the process and inspection at the raw material procurement stage, ADVISE a better proposal to implement (a) in terms of profita bility and (b) in terms of long term business strategy?

Solution:-

(i) Customer demand for Cool Air's products is 1,00,000 units per annum. However, 5,000 defective units supplied are to be replaced free of charge by the company. Therefore, the total number of items supplied to customers per annum = 1 ,00,000 + 5,000 units = 1,05,000 units. The cost of replacement would include raw material cost, assembly & machining cost and delivery cost of 5,000 units = 5,000 units × (900+500+100) per unit = 5,000 units × ₹ 1,500 per unit = ₹ 75,00,000 per annum. Further, had the sale returns not happened, market share would have increased by 50,000 units. Contribution is ₹ 1,000 per unit, for 50,000 units contribution would be ₹ 5,00,00,000. Therefore, the cost of poor quality per annum = cost of replacement + contribution from lost sales = ₹ 75,00,000 + ₹ 5,00,00,000 = ₹ 5,75,00,000 per annum.

(ii) Inspection at the end of the process would detect defects before delivery to the customers. This would ensure that the sale returns would be nil. Given in the problem, 5,000 units supplied are defective and would need to be replaced, in other words, they need to be manufactured again. In other words, inspection after production, before delivery to customers would not prevent production of defective units. However, compared to the current scenario, since these defective units have not yet been delivered to the customer, the cost for additional delivery of replaced products would be saved. This savings in the extra delivery cost = 5,000 units × ₹ 100 per unit = ₹ 5,00,000 per annum. Further, had the sale returns not happened, market share would have increased by 50,000 units. Contribution is ₹ 1,000 per unit, for 50,000 units it would be ₹ 5,00,00,000 per annum. However, additional failure cost for 2,500 units due to increase in sales from 1,00,000 to 1,50,000 units would be incurred. Since these defective units have not yet been delivered to the customer, this cost would be net of delivery cost. This additional failure cost = 2,500 units × ₹ 1,400 per unit = ₹ 35,00,000 per annum. Therefore, the total benefit from the inspection process before delivery to customers = savings on delivery costs + contribution from incremental sales - additional failure cost = ₹ 5,00,000 + ₹ 5,00,00,000 - ₹ 35,00,000 = ₹ 4,70,00,000 per annum. The cost to the company to maintain good quality of its products through inspection =

₹ 2,00,00,000 per annum. Therefore, the net benefit to the company would be ₹ 2,70,00,000 per annum.

(iii) Inspection of raw material at the procurement stage could entirely eliminate defective production. The benefit would be two-fold, the current replacement cost for 5,000 units will no longer be incurred. Secondly, due to better customer perception, market share would increase, resulting in an increased contribution / revenue to the company. In other words, the cost of poor quality will be nil.

As explained in solution (i), the cost of poor quality per annum = cost of replacement + contribution from lost sales = ₹ 75,00,000 + ₹ 5,00,00,000 = ₹ 5,75,00,000 per annum. This would be the benefit by implementing the proposal.

Cool Air has to incur an inspection cost to ensure this highest standard of quality (0% defects) which would cost ₹ 4,00,00,000 per annum. Therefore, the net benefit to the company would be ₹ 1,75,00,000 per annum.

(iv) (a) The proposal to implement inspection immediately before delivering goods to the customers results in a net benefit of ₹ 2,70,00,000 per annum. Alternately, the proposal to implement inspection at the raw material procurement stage results in a net benefit of ₹ 1,75,00,000 per annum. Therefore, from a profitability point of view, inspection immediately before delivery of goods to the customer would the preferred option.

(b) The drawback of inspection at the end of the production process is that (1) it cannot prevent production of defective goods and (2) information regarding the root cause of defective production, in this case, supply of defective raw materials will not get tracked. Therefore, inspection at the end of production does not contribute to resolving the root cause of defective production. On the other hand, inspection at the procurement stage can eliminate production of defective goods. This will ensure a much higher quality of production, better utilization of resources and production capacity. Therefore, from a long-term strategy point of view, inspection at the raw material procurement stage will be very beneficial. Currently the cost of ensuring this highest quality of production (0% defects) is ₹ 4 crores per annum. The cost of ensuring 100% quality is quite high, such that the net benefit to the company is lesser than the other proposal. However, due to its long-term benefit, Cool Air may consider some minimum essential quality control checks at the procurement stage. Although selective quality check might not ensure complete elimination of defective production, it can contribute towards reducing it. At the same time cost of selective quality check would not be so high as to override its benefits. To determine the extent of quality control inspection, Cool Air should determine its tolerance limit for defective production and do an analysis of the quality / cost trade-off.

Question 7:–

KIWI Ltd. manufactures spare parts and can be called "high volume based" manufacturing environment. The company is using the system of TPM for maintaining and improving the integrity of manufacturing process. There are several different automated manufacturing machines located in the plant, through which manufacturing of spare parts are done and supplied to cater the demand in the market.

A 12- hour shift is scheduled to produce a spare part in KIWI Ltd. as shown in the schedule below. The shift has three 15- minute breaks and a 10- minute clean up period.

Production Schedule for Automated machine NZ 10:

Cycle: 10 (seconds),

Spare parts Manufactured: 3,360, SCRAP: 75,

Unplanned Downtime: 36 minutes

Required

CALCULATE OEE (Overall Equipment Effectiveness) and comment on it.

Solution

Calculation of Planned Production Time

<div align="right">Mins.</div>

	Mins.
Total time (12 hrs. × 60 mins.)	720
Less: Planned downtime	

break (3 × 15 mins.)	45
clean up time	10
Planned Production Time	665

Availability Ratio per shift	=	
	=	$\left(\dfrac{665\ min. - 36\ min}{665\ min.} X100\right)$ 94.59 %
Actual Production	=	3,360 parts
Standard time	=	10 seconds
Standard Time Required	=	3,360 parts × 10 seconds/ 60
	=	560 minutes
Actual Time Taken	=	665 mins. – 36 mins.
	=	629 minutes

Performance Ratio = $\left(\dfrac{560\ mins}{629\ mins}\right) X\ 100$ = 89.03%

Quality Ration = $\left(\dfrac{3,360\ Parts - 75\ parts}{3,360\ parts}\right) X\ 100$ = 97.77%

	=	97.77%
Thus, OEE	=	0.9459 × 0.8903 × 0.9777
	=	82.34%

Comment

Since the OEE of KIWI Ltd is very close to 85% i.e. world class performance level, company should take measures to improve it and strive to attain 85% level. Availability Ratio of machine NZ 10 is 94.59% exceeding the ideal value of > 90% which is good but the Performance and Quality Ratios need attention as they are below their ideal values of > 95% and > 99% respectively.

Question 8:–

Pearson Metal and Motor Works (PM2W) deals in manufacturing of the copper wired electronic motor, which is specifically designed. PM2W is thinking to shift from traditional system to JIT system as part of process innovation.

CEO among the other top bosses at PM2W are hopeful that implementation of JIT will not only improve value in value chain for end consumer, but also improve overall manufacturing cycle efficiency. JIT pre-implementation team was formed to evaluate the probabilities, which collects following actual and estimated data about process;

Activity Category	Traditional System (Actual)	JIT System (Estimated)
Inspection	40	30

Storage	80	20
Moving	20	10
Processing	60	40

All data in minutes

Further, PM2W decided to practice single piece flow under JIT. PM2W received an order which is due to manufacture and delivered for 10 such motors. Total available production time to produce what customer demands is 480 minutes out of which it normal practice that 30 minutes will be spent in shutdown and cleaning. CEO is also considering JIT purchase apart from JIT production.

Required

    I.   EXPLAIN just in time.

    II.   CALCULATE the 'takt time' and INTERPRET the results.

    III.   ADVISE whether company should shift to JIT.

Solution:-

(i) **Just-in-time** (JIT) is a collection of ideas that streamline a company's production process activities to such an extent that wastage of all kind viz., of time, material and labour systematically driven out of the process with single piece flow after considering takt time.

In JIT, production facility is required to be integrated with vendor system for signal (Kanban) based automatic supply which depends upon demand based consumption. Under JIT system of inventory storage cost is at lowest level due to direct issue of material to production department as and when required and resultantly less/no material lying over in store or production floor.

Prerequisite of JIT system is integration with vendor, if vendor is not integrated properly or less reliable, then situation of stock out can arise and which can result into loss of contribution.

Multitasking by employee is another key feature of JIT, group of employees should be made based upon product instead based upon function. Hence, functional allocations of cost become less appropriate.

Overall, JIT enhance the quality into the product by eliminating the waste and continuous improvement of productivity.

Takt Time is the maximum available time to meet the demands of the customer; this will help to decide the speed of/ at manufacturing facility.

Takt time is the average time between the start of production of one unit and the start of production of the next unit, when these production starts are set to match the rate of customer demand.

$$\text{Takt Time} = \frac{\text{Available Production Time}}{\text{Total Quantity Required}}$$

Here,

Available Production Time is 'total available time for production' – 'planned downtime

i.e. spent in shutdown and cleaning' i.e. 450 minutes = 480 minutes – 30 minutes. Total Quantity Required is 10 units

Takt Time = $\dfrac{450 \text{minutes}}{10 \text{units}}$ = 45 Minutes

Note - Heijunka can be applied in order to reduce variation between 'Takt times' over the production.

Interpretation

Customer's demand is 10 units, to calculate the takt time, divide the available production time (in minutes) by the total quantity required. The takt time would be 45 minutes. This means that process must be set up to produce one unit for every 45 minutes throughout the time available. As order volume increases or decreases, takt time may be adjusted so that production and demand are synchronized.

Advise on Shifting to JIT

To evaluate how much of the old cycle time was spent in inventory, we need to know how organizations assess the efficiency of their manufacturing processes. One commonly used measure is process cycle efficiency and to calculate the same every process is breakdown into combination of activities such as value added activities, non- value added activities and non-value added activities but strategic activities. In order to generate highest value to customer, only value added activities are included in process. But those non-value added activities, which are strategic in nature, also need to be part of process. Therefore, it may be possible that entire process is not efficient.

To measure efficiency of process, managers keep track of the relation between 'times taken by value added activities' in comparison 'total cycle time'. Such relation/ratio is processing cycle efficiency.

$$\text{Process Cycle Efficiency} = \dfrac{\text{Value Added Time}}{\text{Cycle Time}}$$

Processing time is considered as value added time; whereas time spend on inspection, storage and moving is non-value added time and included in cycle time. The higher the percentage, less the time (and costs) needs to be spent on non- value added activities such as moving and storing etc.

Computation of Processing Cycle Efficiency

Sr. No.	Activity Category	Traditional System (Actual)	JIT System (Estimated)
A.	Inspection	40	30
B.	Storage	80	20
C.	Moving	20	10
D.	Processing	60	40
E.	Value Added Time	60	40
F.	Cycle Time ...(A)+(B)+(C)+(D)	200	100
	Process Cycle Efficiency ...(E)/(F)×100	30%	40%

Of the 200 minutes required for manufacturing cycle under PM2W's traditional system, only 60

minutes were spent on actual processing. The other 140 minutes were spent on non- value added activities, such as inspection, storage, and moving. The process cycle efficiency formula shows that processing time equalled to 30% of total cycle time. The cycle time is reduced substantially in the JIT system from 200 minutes to 100 minutes. In addition to this, the amount of time that used up in inventory i.e. non-value-added activities is also reduced. Therefore, process cycle efficiency has been increased from 30% to 40%. This significant improvement in efficiency over the previous system comes from the implementation of JIT system. Therefore, it is advantageous to shift to JIT system.

Question 9:–

Pixel Limited is a toy manufacturing company. It sells toys through its own retail outlets. It purchases materials needed to manufacture toys from a number of different suppliers. Recently, due to the entity of few reputed foreign brands in the toy market and particularly i n the segment in which Pixel Ltd. is doing business, it is facing a threat to operate profitably.

Each toy requires 4 kg. of materials at ₹ 19 per kg. and 5% of all materials supplied by the suppliers are found to be substandard. Labour hour requirement fo r each toy is 0.4 hour at ₹ 120 per hour.

Market research has determined that the selling price will be ₹ 240 per toy. The company requires a profit margin of 15% of the selling price. Expected demand for toy in the coming year will be 50,000 toys. Sales and variable overhead per unit for the four quarters of the year will be as follows:

	Q1	Q2	Q3 (Festive season)	Q4 (Festive season)
Sales (units)	7,500	9,000	15,500	18,000
Variable overhead per unit (₹)	22	22	24	25

Total fixed overheads are expected to be ₹ 6,25,000 for each quarter.

The production manager has decided to produce 12,500 units in each quarter. Inventory holding costs will be ₹ 18 per unit of average inventory per quarter. Inventory holding costs are not included in above.

Normal production capacity per quarter is 15,000 toys. The company can produce further up to 6,000 units per quarter by resorting to overtime working. Overtime wages will be at 150% of normal wage rate.

Assume zero opening inventory.

Required

I.   CALCULATE the cost gap that exists between the total cost per toy as per the production plan and the target cost per toy.

II.   DISCUSS how just-in-time purchasing and just-in-time production will remove the cost gap calculated in (i) above. Show calculations in support of your answer.

III.   EXPLAIN, how implementation of JIT production method can be a major source of competitive advantage and success of the company.

Solution:-

(i) Cost gap between Total Cost per toy as per the production plan and the Target Cost per toy

Target Cost per toy

Sr. No.	Particulars	₹ per unit	For Annual Sales of 50,000 units
1	Selling Price per toy	240	1,20,00,000
2	Required Profit Margin (15% of selling price =15% ×₹ 240 per unit)	36	18,00,000
3	Target Cost per annum (Step 1 - 2)		1,02,00,000
4	Target Cost per toy (Step 3 / 50,000 units)		204.00

Therefore, Target Cost is ₹ 204 per toy.

Total Cost as per production plan

Pixel Ltd. has an annual production requirement of 50,000 toys, which is also its annual sales. Given that opening inventory for the first quarter is nil. The production manager wants to produce 12,500 units per quarter irrespective of the sales demand for the quarter. This implies that during some quarters, there might be unsold inventory, for which inventory holding cost has to be borne. This type of production is called "produce to stock".

Production Schedule and Inventory Holding Cost for the year

Sr. No.	Particulars	Q1	Q2	Q3	Q4	Total for the year
1	Opening Stock (units)	-	5,000	8,500	5,500	
2	Production (units)	12,500	12,500	12,500	12,500	50,000
3	Sales (units)	7,500	9,000	15,500	18,000	50,000
4	Closing Stock (units) (Step 1 + 2 – 3)	5,000	8,500	5,500	-	
5	Average Inventory = (Step 1+ Step 4)/ 2	2,500	6,750	7,000	2,750	
6	Inventory Holding Cost (Average Inventory × ₹ 18 per unit of Average Inventory)	₹ 45,000	₹ 1,21,500	₹ 1,26,000	₹ 49,500	₹ 3,42,000

Total Cost of Production per toy as per production plan

Sr. No	Particulars	Q1	Q2	Q3	Q4	Total for 50,000

						units
1	Direct Material Cost per unit (Note 1)	₹ 80	₹ 80	₹ 80	₹ 80	₹ 40,00,000
2	Direct Labour Cost per unit (Note 2)	₹ 48	₹ 48	₹ 48	₹ 48	₹ 24,00,000
3	Variable Overhead Cost per unit	₹ 22	₹ 22	₹ 24	₹ 25	₹ 11,62,500
4	Total Variable Cost per unit for the quarter (other than inventory holding cost) [Steps 1+ 2+3]	₹ 150	₹ 150	₹ 152	₹ 153	
5	Production (units) for the quarter (refer production schedule above)	12,500	12,500	12,500	12,500	50,000
6	Total Variable Cost for the quarter (other than inventory holding cost) [Step 4 × Step 5]	₹ 18,75,000	₹ 18,75,000	₹ 19,00,000	₹ 19,12,500	₹ 75,62,500
7	Inventory Holding Cost for the quarter (refer to the production schedule above)	₹ 45,000	₹ 1,21,500	₹ 1,26,000	₹ 49,500	₹ 3,42,000
8	Fixed Overheads	₹ 6,25,000	₹ 6,25,000	₹ 6,25,000	₹ 6,25,000	₹ 25,00,000
9	Total Cost [Step 6 + Step 7+Step 8]	₹ 25,45,000	₹ 26,21,500	₹ 26,51,000	₹ 25,87,000	₹ 1,04,04,500
10	Total Cost per toy as per production schedule (Step 9 / 50,000 units)					₹ 208.09

Note 1

Each toy requires 4kg of material, 5% of all materials is substandard. Therefore, procurement should factor this substandard quality.

Material required per unit = 4 kg / 95% = 4.21 kg

Material Cost per toy produced = 4.21 kg ×₹ 19 per kg = ₹ 80 per unit

Note 2

Each toy requires 0.40 hours. Rate per hour is ₹ 120 per hour. Therefore, Cost per toy = 0.40 × ₹ 120 = ₹ 48 per unit

Cost Gap

= Total Cost per toy as per production schedule – Target Cost per toy

= ₹ 208.09 - ₹ 204.00 per toy

= ₹ 4.09 per toy

JIT System

(ii) Just in Time Purchasing and Just in Time Production is aimed at eliminating inventory holding of raw material and finished goods respectively. Components are purchased only when there is a requirement in the production process. Similarly, finished goods are produced only when there is a demand for them. This type of production is called "produce to order". Hence, there is neither any opening inventory nor any closing inventory, thereby no inventory holding cost.

In the given problem, this savings is off-set by the extra payment to be made to labor for overtime. Production capacity is 15,000 toys per quarter. This can be increased by 6,000 toys per quarter by incurring additional overtime cost.

The Production Plan under the Just in Time System

Sr. No.	Particulars	Q 1	Q 2	Q 3	Q 4	Total for the year
1	Opening Stock (units)	-	-	-	-	
2	Production (units)	7,500	9,000	15,500	18,000	50,000
3	Sales (units)	7,500	9,000	15,500	18,000	50,000
4	Closing (units)	-	-	-	-	
5	Inventory Holding Cost	-	-	-	-	
6	Production Beyond Capacity of 15,000 Toys per quarter (units)	-	-	500	3,000	

Total Cost of Production under JIT System

Sr. No	Particulars	Q1	Q2	Q3	Q4	Total for 50,000 units

1	Direct Material Cost per unit (Note 1)	₹ 76	₹ 76	₹ 76	₹ 76	38,00,000
2	Direct Labour Cost per unit	₹ 48	₹ 48	₹ 48	₹ 48	24,00,000
3	Variable Overhead Cost per unit	₹ 22	₹ 22	₹ 24	₹ 25	11,85,000
4	Total Variable Cost per unit (Steps 1+ 2+3)	₹ 146	₹ 146	₹ 148	₹ 149	
5	Production (units) for the quarter (Refer JIT production schedule above)	7,500	9,000	15,500	18,000	50,000
6	Total Variable Cost for the quarter (Step 4 × Step 5)	₹ 10,95,000	₹ 13,14,000	₹ 22,94,000	₹ 26,82,000	₹ 73,85,000
7	Production (units) for the quarter in excess of capacity (Refer JIT production schedule above)	-	-	500	3,000	3,500
8	Overtime Labour Cost for production in excess of capacity (Note 2) [Step 7 × 0.40 × 50% ×₹ 120 per hour]	₹ 0	₹ 0	₹ 12,000	₹ 72,000	₹ 84,000
9	Fixed Overheads	₹ 6,25,000	₹ 6,25,000	₹ 6,25,000	₹ 6,25,000	₹ 25,00,000
10	Total Cost for production under the JIT System (Step 6 + Step 8+ Step 9)	₹ 17,20,000	₹ 19,39,000	₹ 29,31,000	₹ 33,79,000	₹ 99,69,000
11	Total Cost per toy as per production schedule (Step 10 / 50,000 units)					₹ 199.38

Note 1

Carefully selected suppliers of delivering high quality materials in a timely manner directly at the shop floor, reducing the material receipt time and loss due to sub-standard material.

Note 2

Overtime wages are 150% of normal wage rate. Therefore, for every toy produced over the quarterly production capacity of 15,000 toys, 50% extra wage over and above the hourly rate has to be paid as overtime wages. Each toy needs 0.40 hours for production. Therefore, overtime cost for excess production = excess production units × 0.40× 50% ×₹ 120 per hour.

Cost Gap

The cost of production per toy under the JIT system is ₹ 199.38 per toy as compared to the target cost of ₹ 204 per toy and save ₹ 4.62 per toy.

The savings primarily comes from eliminating the inventory holding cost of ₹ 3,42,000 per annum and sub- standard material cost of ₹ 2,00,000 per annum under the previous production system. This is slightly offset by the additional cost of ₹ 84,000 per annum that has to be paid towards overtime labor charges and ₹ 22,500 towards additional variable overheads. However, by switching to the JIT system, Pixel Ltd. could reduce its production cost below the target cost per toy.

JIT system aims at:

- Meeting customer demand in a timely manner.

- Providing high quality products and

- Providing products at the lowest possible price.

The main features of the JIT production system are:

- Material handling cost is reduced – materials move from one machine to another in an organized sequence. The production process is grouped into to manufacturing cells. These can be managed with minimal labor. This reduces material handling costs as also any pile up of inventory in the form of work-in- progress. In JIT procurement process, the raw material is received only when needed. Due to significant reduction in inventory, inventory holding costs, normal wastage cost and spoilage can be avoided. Optimum arrangement of cells can lead to lesser floor space requirement, thereby reducing factory rental and overhead cost.

- Multi-skilled labor: Hire and retain multi-skilled workers who are capable of performing a variety in operations including repairs and maintenance. Therefore, a worker is not confined to only one process in the production process. He can contribute towards other processes as well. This reduces the workforce requirement and labor idle time. The company can have a more efficient workforce, with lesser number of workers. There is potential to reduce labor cost on account of this.

- Minimizing defects rework and scrap: Each stage of the production process is tightly linked in a sequential manner. Defective output from one stage will stop the work at the next stage. Due to this, workers can identify and correct errors or defects instantaneously. JIT creates urgency for eliminating defects as quickly as possible since the downstream work also stops due to error in any workstation. Production process efficiency improves and reduces rework or scrap. The overall quality of production improves. There are other benefits to streamling production process: lesser need for inspection of final output and lesser sales returns due to defects. This would contribute to the product's brand value .

- ▪ Reduced set-up time: Streamlined production process under JIT reduces set-up time at the workstations. When the production process has to change to make the product per the customers' demands, set-up time is incurred at the workstation. By streamlining operations, JIT system aims at reducing the set-up time, so that production can continue with the least possible interruption. This brings flexibility in the operations since the company can quickly change the production requirement, to make products to meet the customer's demand. Quick turnover improves productivity of the machine, thereby increasing the production capacity. Lesser time is spent on set-up which is not a value adding activity.

Reduces lead time for receiving materials since the suppliers of raw material are capable of delivering high quality materials in a timely manner directly at the shop. Proper selection of such suppliers is imperative for the JIT system to be successful. If this can be achieved, then it is beneficial for the company since inventory holding of material is eliminated along with receiving better quality of raw material in a timely manner.

Eliminating inventory holding, scrap, material wastage, flexibility in operations by reducing set-up time, better response time to customer's demands, better skilled workforce, better quality of production, lower workforce requirement, lower floor space requirement all of these contribute towards lowering working capital requirements. These contribute to a company's competitive edge and success.

Question 10:–

Storewell Industries Ltd. manufactures standard heavy duty steel storage racks for industrial use. Each storage rack is sold for ₹ 750 each. The company produces 10,000 racks per annum. Relevant cost data per annum are as follows:

Cost Component	Budget	Actual	Actual Cost p.a. (₹)
Direct Material	5,00,000 sq. ft.	5,20,000 sq. ft.	20,00,000
Direct Labour	90,000 hrs.	1,00,000 hrs.	10,00,000
Machine Setup	15,000 hrs.	15,000 hrs.	1,50,000
Mechanical Assembly	200,000 hrs.	200,000 hrs.	30,00,000

The actual and budgeted operating levels are the same. Actual and standard rates of material procurement and hourly labor rate are also the same. Any variance in cost is solely on account of difference in the material usage and hours required to complete production. Aggressive pricing from competitors has driven down sales. A comparable rack is available in the market for ₹ 675 each. Vishal, the marketing manager has determined that in order to maintain the company's existing market share of 10,000 racks, Storewell Industries must reduce the price of each rack to ₹ 675.

Required

i.   CALCULATE the current cost and profit per unit. IDENTIFY the non-value added activities in the production process.

ii. CALCULATE the new target cost per unit for a sales price of ₹ 675 if the profit per unit is maintained.

iii. RECOMMEND what strategy Storewell Industries should adopt to attain target cost calculated in

(ii) above.

Solution:-

The current cost and profit per unit are calculated as below:

Cost Component	Units	Actual Cost p.a. for 10,000 racks (₹)	Actual Cost per rack (₹)
Revenue	10,000 racks	75,00,000	750
Direct Material	5,20,000 sq. ft.	20,00,000	200
Direct Labour	1,00,000 hrs.	10,00,000	100
Machine Setup	15,000 hrs.	1,50,000	15
Mechanical Assembly	200,000 hrs.	30,00,000	300
Total Cost		61,50,000	615
Profit		13,50,000	135

Therefore, the current cost is ₹ 615 p.u. while the profit is ₹ 135 p.u. Machine setup is the time required to get the machines and the assembly line ready for production. In this case, 15,000 hours spent on setting up does not add value to the storage racks directly. Hence, it is a non-value add activity.

(ii) New sale price per rack is ₹ 675 per unit. The profit per unit needs to be maintained at

₹ 135 per unit. Hence, the new target cost per unit = new selling price per unit –required profit per unit = ₹ 675 - ₹ 135 = ₹ 540 per unit.

(iii) As explained above, current cost per unit is ₹ 615 while the target cost per unit is ₹ 540. Hence, the cost has to be reduced at least by ₹ 75 per unit. Analysis of the cost data shows the variances between the budget and actual material usage and labor hours. It is given that the material procurement rate and labor hour rate is the same for budgets and actuals. Hence, the increment in cost of direct materials and labor is due to inefficient use of material and labor hours to complete the same level of production of 10,000 storage racks.

Corrective actions to address these inefficiencies could result in the following savings:

(a) Inefficiencies resulted in use of extra 20,000 sq. ft. of material.

Material cost per sq. ft. = Actual cost / Actual material usage = ₹ 20,00,000 / 5,20,000 sq. ft. = ₹ 3.85 per sq. ft.

Therefore, inefficiencies resulted in extra cost = 20,000 sq. ft. × ₹ 3.85 per sq. ft. =

₹ 77,000.

If corrective action is taken, for 10,000 racks this translates to a saving of ₹ 7.70 per unit.

(b) Inefficiencies resulted in extra 10,000 hrs. to be spent in production.

Labor cost per hr. = Actual cost / Actual labor hrs. = ₹ 10,00,000 / 10,000 hrs. = ₹ 10 per hr.

Therefore, inefficiencies resulted in extra cost = 10,000 hrs. × ₹ 10 per hour =

₹ 100,000.

If corrective action is taken, for 10,000 racks this translates to a saving of ₹ 10 per unit.

(c) Machine setup cost is a non-value added cost. Value analysis can be done to determine if the setup time of 15,000 hrs. can be reduced. However, since these activities have been carried out for a reason, care should be taken to ensure that this change should not adversely impact the production activity later down the stream.

(d) Mechanical assembly cost is almost half of the total cost. These are costs incurred during the production process on the assembly line. Value analysis can be done to determine if the production process can be made more efficient. For example, the process can be streamlined, such that steps can be combined that can be handled by fewer people (process centering). Similarly, value analysis / value engineering can focus on the product design.

Some questions to raise may be:

- **Can the product be designed better to make the production more efficient?**
- **Can the design be minimized to include fewer parts and thus make it easier and efficient to manufacture?**
- **Can be substitute parts to make it more efficient? Or**
- **Is there simply a better way of producing the same product?**

While target costing is a dynamic and corrective approach, care must the taken the product quality, characteristics and utility are maintained.

Question 11:–

Mould & Dies (M&D) was established in 1980 and has enormous wealth of experience in the mould manufacturing industry and serves wide range of plastic moulds all over nation. Over the past decade, M&D has developed the reputation for quality products & services for customer focused approach. It deals in injection moulds, blow moulds, die sets, moulds base etc.

With a state-of-the-art infrastructure facility, M&D is able to meet the qualitative and quantitative demands of its clients. Its vision & mission is to provide high class manufactured products by using best quality raw materials.

M&D has developed a new product "M" which is about to be launched into the market and anticipates to sell 80,000 of these units at a sales price of ₹ 300 over the product's life cycle of four years. Data pertaining to product "M" are as follows:

Costs of Design and Development of Molds, Dies, and Other Tools	₹ 8,25,000
Manufacturing Costs	₹ 125 per unit
Selling Costs	₹ 12,500 per year + ₹ 100 per unit
Administration Costs	₹ 50,000 per year
Warranty Expenses	5 Replacement Parts per 25 units at ₹ 10 per part; 1 Visit per 500 units (Cost ₹ 500 per visit)

Required

1. COMPUTE the product "M"'s 'Life Cycle Cost'.

2. SUGGEST two ways to maximize "M''s lifecycle return.

Note: Ignore time value of money

Solution:-

Statement Showing "M's Life Cycle Cost (80,000 units)"

Particulars	Amount (₹)
Costs of Design and Development of Molds, Dies, and Other Tools	8,25,000
Manufacturing Costs (₹ 125 × 80,000 units)	1,00,00,000
Selling Costs (₹ 100 × 80,000 units + ₹ 12,500 × 4)	80,50,000
Administration Costs (₹ 50,000 × 4)	2,00,000
Warranty (80,000 units / 25 units × 5 parts × ₹ 10) (80,000 units / 500 units × 1 visit × ₹ 500)	1,60,000 80,000
Total Cost	1,93,15,000

(ii) Following ways are suggested to maximize "M" lifecycle return:

R&D Costs

Often significant part of cost (even above 80%) is committed at the R&D phase of new product, hence M&D should carefully plan and design its new product "M" as it will determine the number of parts, production process to be used etc. M&D can apply value engineering here. It involves improving product quality, reducing product costs, fostering innovation, eliminating unnecessary and costly design elements, ensuring efficient investment in product, and developing implementation procedures. Value engineering is most successful when it is performed early in product development stage. A value engineering study should be performed within the first 25-30% of the design effort prior to selecting the final design alternative. Here, it is also important that R&D team should work as a part of cross functional team i.e. (participate in a group of people from different functional areas), to minimise lifecycle cost and the production cycle time in new development.

Speed up the Product Launch

In cut throat competitions, it is important for M&D to get new product 'M' launch into the market as soon as possible since this will give "M" a long stay in the market place without competition in the market. Competitor always try to launch a rival product as quickly as possible in order to gain

'competitive edge'. M&D may lose overall profitability if it delays in launching of Product 'M'. It is usually worthwhile incurring extra costs to keep the launch on schedule or to speed up the launch.

Question 12:–

"QR" Ltd. is the leading manufacturer and exporter of high quality leather products - Product Q and Product R. Selling price per unit of Product Q and Product R is ₹ 620 and ₹ 420 respectively.

Both the products pass through three processes - Tanning, Dyeing and Finishing during manufacturing process. Allocation of costs per unit of leather products manufactured among the processes are given below:

Particulars	Tanning	Dyeing	Finishing	**Total**
Direct Materials Cost ₹ per unit	140	180	140	460
Direct Labour Cost ₹ per unit	90	120	90	300
Cost allocation to Product Q	70%	50%	70%	
Cost allocation to Product R	30%	50%	30%	

General overheads per unit of leather products Q or R manufactured are ₹ 115. This blanket absorption rate is derived after division of total general overhead with number of leather product be it Q or R. Above cost allocation is the basis for the decisions regarding pricing of the products.

In this Industry, all the major production processes have environmental impact at all stages of the process, including generation of waste, emission of harmful gases, noise pollution, water contamination etc.

The management of the company is worried about the above environmental impact and has taken initiative to preserve the environment like - research and development activities aimed at reducing pollution level, planting trees, treatment of harmful gases and airborne emissions, wastewater treatment etc.

The management of the company desires to adopt Environmental Management Accounting as a part of strategic decision-making process. Pricing of products should also factor in environmental cost generated by each product.

General overheads blanket rate per unit of leather products (be it Q or R) manufactured are

₹ 115 which includes–

Treatment cost of harmful gases……………….…   ₹ 40

Wastewater treatment cost……………………….. ₹ 50

Cost of planting of trees…………………………………….. ₹ 10

Miscellaneous……………………………………………. ₹ 15

Process wise information related to generation of wastewater and harmful gases is given as below–

	Tanning	Dyeing	Finishing	Total
Wastewater generated (litres per week)	900	600	0	1,500
Emission of harmful gases (cc per week)	400	300	100	800
Cost allocation to Product Q	70%	50%	70%	
Cost allocation to Product R	30%	50%	30%	

The remaining overheads cost (miscellaneous) and cost of planting trees can be allocated equally between Product Q and Product R.

Required

I. CALCULATE the product wise profitability based on the original cost allocation.
II. RECALCULATE the product wise profitability based on activity-based costing (Environment driven costs).
III. ANALYZE the difference in product profitability as per both the methods.

Solution:-

Product Wise Profitability as per Original Allocation Methodology

(Figures in ₹ per unit of leather produced)

Particulars	Product Q	Product R	Total
Selling Price	620	420	1,040
Direct Material (Refer Table 1)	286	174	460
Direct Labour (Refer Table 1)	186	114	300
Overheads	115	115	230
Total Expenses	587	403	990

Profit	33	17	50
Profitability (%)	5.32%	4.05%	×

Workings

Table 1 Cost Allocation to the Products

(Figures in ₹ per unit of leather produced)

Particulars	Tanning			Dyeing			Finishing			Total		
	Q	R	Total	Q	R	Total	Q	R	Total	Q	R	Grand Total
Direct Material	98	42	140	90	90	180	98	42	140	286	174	460
Direct Labour	63	27	90	60	60	120	63	27	90	186	114	300

(ii) Product wise profitability based on activity-based costing using environment driven costs requires the following steps:

- For convenience let presume only 2 units (1Q and 1R) are manufactured, currently the total overhead of ₹ 230 (115×2) is equally divided between Q and R i.e. ₹ 115 per unit of Q and R. But this is blanket or convention approach of allocation and misleading too. Hence the total overhead of ₹ 230 need to be divided such as ABC as required in question
- Breakdown of total overhead cost of ₹ 230 per unit into treatment cost of harmful gases, wastewater treatment cost, cost of planting trees and other overhead costs. Refer Table 2 for the breakup.
- Treatment cost of harmful gases, wastewater treatment cost need to be individually allocated to various processes based on relevant cost drivers. Refer Table 3 for cost allocation to process.
- The overheads mentioned in point above thus allocated to the various processes, will be reallocated to products based on the specific ratios given in the problem. Refer Table 4 for cost allocation to products.

Product Wise Profitability Statement based on ABC using environment driven costs

(Figures in ₹ per unit of leather produced)

Particulars	Product Q	Product R	Total
Selling Price	620	420	1,040
Direct Material (Refer Table 1)	286	174	460

Direct Labour (Refer Table 1)	186	114	300
Allocation of Overheads			
Treatment Cost of Harmful Gases (Refer Table 4)	50	30	80
Wastewater Treatment Cost (Refer Table 4)	62	38	100
Cost of Planting Trees (shared equally)	10	10	20
Other Overhead Cost (shared equally)	15	15	30
Total Expenses	609	381	990
Profit	11	39	50
Profitability %	1.77%	9.29%	×

Workings

Table 2: Breakdown of General Overheads (at total level of ₹ 230)

Overhead	Amount (₹)	Allocation basis between products
Treatment Cost of Harmful Gases	80	Emission of Harmful Gases (cc per week)
Wastewater Treatment Cost	100	Wastewater Generated (litres per week)
Cost of Planting Trees	20	Equally between Products Q and R
Miscellaneous	30	Equally between Products Q and R
Total General Overheads	230	

Table 3: Allocation of Treatment Cost to various process

Process Wise Information (Basis of apportionment, Cost Driver and their volume)

Overhead	Amount (₹)	Allocation Basis Between Products	Tanning	Dyeing	Finishing	Total
Treatment Cost of Harmful Gases	80	Emission of Harmful Gases (cc per week)	400cc	300cc	100cc	800cc
Wastewater Treatment Cost	100	Wastewater Generated (ltr. per week)	900lt.	600lt.	---	1,500lt.

Cost Allocation to Process

Overhead	Amount (₹)	Allocation Basis Between Products	Tanning (₹)	Dyeing (₹)	Finishing (₹)	Total (₹)
Treatment Cost of Harmful Gases	80	Emission of Harmful Gases (cc per week)	40	30	10	80
Wastewater Treatment Cost	100	Wastewater Generated (litres per week)	60	40	0	100

Table 4: Reapportionment of Treatment Cost to Product Q and R   (₹)

Overhead	Tanning	Dyeing	Finishing	Total
Treatment Cost of Harmful Gases	₹ 40	₹ 30	₹ 10	₹ 80
Cost Allocation % to Product Q	70%	50%	70%	×
Cost Allocation % to Product R	30%	50%	30%	×
Cost Allocation to Product Q	₹ 28	₹ 15	₹ 7	₹ 50
Cost Allocation to Product R	₹ 12	₹ 15	₹ 3	₹ 30
Wastewater Treatment Cost	₹ 60	₹ 40	---	₹ 100
Cost Allocation % to Product Q	70%	50%	70%	×

Cost Allocation % to Product R	30%	50%	30%	×
Cost Allocation to Product Q	₹ 42	₹ 20	---	₹ 62
Cost Allocation to Product R	₹ 18	₹ 20	---	₹ 38

Analysis of the difference in product profitability as per both the methods

In the first method, general overhead costs are allocated to the products Q and R, irrespective of the environment costs that each product incurs. General overhead costs are to each product equally. The resultant product profitability shows that Product Q yields 5.32% and Product R yields 4.05% profitability. Therefore, the "QR" Ltd. would conclude that Product Q is more profitable.

In the next method, general overhead costs are bifurcated to identify "hidden" environment costs that are incurred on account of manufacturing these products. Environment costs are first traced to the process that generates harmful gases and wastewater, for which treatment is done. It can be seen that Tanning process, followed by Dyeing and Finishing process generates the maximum amount of waste. Therefore, by proportioning the cost based on the waste generated, more cost is allocated to Tanning the process. Similarly, Dyeing and Finishing are allocated lesser cost since they do not generate as much waste. It is further given that 70% of the cost of Tanning relates to Product Q. This is much higher than the 50% that was allocated to the Product as per the first method.

Accordingly, the revised workings show that Product Q yields 1.77% and Product R yields 9.29% profitability. The reason being, Product Q generates more environment driven costs as compared to Product R.

"QR" Ltd. would therefore increase the selling price of Product Q if it wants to maintain profitability as per the original method. However, the more sustainable approach would be find out ways of reducing wastewater and harmful gases the manufacturing process produces. This would in turn result in reduction of environment driven costs such as wastewater treatment and treatment of harmful gases. This would sustain profits in the long run.

Question 13:-

DBA, manufactures and sells 25,000 table fans annually. One of the components required for fans is purchased from an outside supplier at a price of ₹ 190 per unit. Annually it is purchasing 25,000 components for its usage. The Production Manager is of the opinion that if all the components are produced at own plant, it is possible to maintain better quality in the finished product. Further, he proposed that the in-house production of the component with other items will provide more flexibility to increase the annual production by another 5,000 units. He estimates the cost of making the component as follows:

₹ per unit

Direct materials	80
Direct labour	75
Factory overhead (70% variable)	40
Total cost	195

The proposal of the Production Manager was referred to the Marketing Manager for his remarks. He pointed out that to market the additional units, the overall unit price should be reduced by 5% and additionally ₹ 1,00,000 p.m. should be incurred for advertising. Present selling price and contribution per fan are ₹ 2,500 and ₹ 600 respectively. No other increase or decrease in all other expenses as a result of this proposal will arise.

Required

Since the making cost of the component is more than the buying cost, the Management asks you to:

i.   ANALYSE the make or buy decision on unit basis and total basis.
ii. RECOMMEND the most profitable alternative.

Solution

DBA purchases 25,000 units of components to manufacture 25,000 fans annually. The external purchase price per component is ₹ 190 per unit. It has the option of manufacturing these components in house. The cost structure of manufacturing these components would be as below:

Cost Structure	Cost per component unit (₹)
Direct Materials	80
Direct Labor	75
Variable Factory Overhead (70% of ₹ 40)	28
Total	183

Analysis

If DBA decides to manufacture the components in-house, the following would be the financial impact:

a. Production Capacity will increase from 25,000 fans to 30,000 fans.
b. Variable Cost of Production of fan would be ₹ 1,710 [(2,500 - 600) -190] per unit.
c. Fixed Factory Overhead of ₹ 12 per component would be incurred irrespective of whether component is produced or not. Therefore, this cost is not considered.
d. Increase in advertising expense would be ₹ 100,000 per month or ₹ 12,00,000 annually.

e. Overall selling price would reduce from the current rate of ₹ 2,500 per fan to ₹ 2,375 (95% of ₹ 2,500) per fan.

f. Current contribution considering a procurement price of ₹ 190 per component unit, is

g. ₹ 600 per fan. As calculated above, if produced in house, the variable cost would be

h. ₹ 183 per component unit. This would result in an increase in contribution by ₹ 7 per fan (procurement price of ₹ 190 per component unit less variable cost of ₹ 183 per component unit). In addition, there is an impact of ₹ 125 on account of reduction in selling price. Therefore, the contribution if component produced in house would be ₹ 482 per fan (₹ 600+₹ 7-₹ 125).

To summarize the above figures:

Particulars	Procurement 25,000 Components		Produce 30,000 Components	
	Per Fan ₹	Total ₹	Per Fan ₹	Total ₹
Selling price per fan	2,500	6,25,00,000	2,375	7,12,50,000
Contribution per fan	600	1,50,00,000	482	1,44,60,000

Therefore, incremental loss by switching to in house production (on a total basis) would be

₹ 17,40,000 (incremental loss ₹ 5,40,000 – additional advertising expenses ₹ 12,00,000). On a per unit basis, it would result in a loss of ₹ 58 per fan.

Recommendation

As explained above, if production increases from 25,000 fans to 30,000 fans, it would not be profitable to make these components in house. Overall profit decreased by ₹ 17,40,000. However, DBA may prefer to make component, even though it could be financially beneficial to buy from outside supplier. Sometimes qualitative factors become very important and can override some financial benefit. This can be coupled with uncertainty about the supplier 's ability or intention to maintain the price, quality, delivery dates of the components etc.

Alternatively, DBA may continue with the sale of 25,000 units without any price reduction and advertising expenses. The component required for the 25,000 fans may be produced internally at a cost of ₹ 183 per unit. In this situation, the contribution shall be increased by ₹ 1,75,000 (₹ 7 ×25,000 units).

Thus, DBA may choice the alternative after due and careful consideration of the facts illustrated above.

Question 14:–

Aditya Group was established in 1975, manufactures and sells electronic personal grooming and beauty products. The group has two 100% subsidiaries AUS Ltd. and ANZ Ltd. AUS Ltd. manufactures luxury products that cater to niche customers who prefer specialized personal grooming and beauty care. ANZ

Ltd. caters to regular daily beauty and grooming requirements that has a wide reach within the market. Factories of both companies are located within India. The products are sold to wholesalers, who supply these products to the retail market.

Aditya Group purchases its raw material requirements from both domestic and overseas markets. Additionally, certain products manufactured by AUS Ltd. can be enhanced based on the products manufactured by ANZ Ltd. Therefore, as per production requirements, AUS Ltd. sources some product components from ANZ Ltd.

Aditya Group has a centralized decision making set-up. Basic policy decisions for functions such as production planning, sales and client relationship, finance and human resources are handled at the group level. Individual units AUS Ltd. and ANZ Ltd. concentrate on the manufacturing alone.

About You

You are an Assistant Manager in Finance and Accounts department of Aditya Group, headed by Director-Finance Ms. Elsea. You assist and report to Ms. Fiona, Manager of your department. Sometime you also assist Director Finance in analysing financial and non- financial information, drafting reports for board meetings, preparation of presentation and staff trainings.

Business Situation- 1

Yesterday, 5.15 P.M.

You got an email from Ms. Elsea, with Cc to Ms. Fiona. Ms. Elsea, asked you to prepare a cost statement for making a quotation to a new customer. She has also informed you that the customer can also maintain a long- term business relation with us. You have been requested to gather information related to the specification from Sales Manager.

Yesterday, 5.25 P.M.

You have been called by Ms. Fiona, and provided the product specification received from Sales- Manager for which quotation has to be quoted. Ms. Fiona has also requested you to gather relevant information to prepare cost statement. Due to the expected long term business relationship that AUS Ltd. wants to have with the customer, the sales manager wants to quote the lowest possible price. AUS Ltd. currently has some spare capacity that can be utilized to cater to this entire order. Therefore, only the relevant cost to AUS Ltd. has to be considered to arrive at the quote.

After meeting with your reporting officer, you mailed to various concerned department and requested for data.

The following information has been obtained in relation to the contract:

Today, 10.05 A.M.

You got an e-mail from Production Manager, it has been informed that 40 tonnes of material Dx would be required. This material is in regular use by AUS and has a current purchase price of ₹ 380 per tonne.

Currently, there are 5 tonnes in inventory which cost ₹ 350 per tonne. The resale value of the material in inventory is ₹ 240 per tonne.

Further, with regards to components, it has been informed that 4,000 components would be required. These could be bought externally for ₹ 15 each or alternatively they could be supplied by ANZ Ltd. The variable cost of the component if it were manufactured by ANZ Ltd. would be ₹ 8 per unit. ANZ Ltd. has sufficient capacity to produce 2,500 components without affecting its ability to satisfy its own external customers. However, in order to make the extra 1,500 components required by AUS Ltd., ANZ Ltd. would have to forgo other external sales of ₹ 50,000 which have a contribution to sales ratio of 40%. To have uniformity in the quality of the component, it is assumed that AUS Ltd. would procure its entire requirement of 4,000 components either externally or from ANZ Ltd. The transfer pricing policy of Aditya Group for sales between units aims at goal congruence. The unit selling the goods would be allowed to charge any opportunity cost on account of catering to internal demand, while the purchasing unit should ensure that the company is not at a loss.

Today, 10.45 A.M.

You got an e-mail from Personnel Manager, it has been informed that 2,000 high skilled labour hours would be required. The grade of labour required is currently paid ₹ 5 per hour. Highly skilled labour is in short supply and cannot be increased significantly in the short -term. This labour is presently engaged in meeting the, demand for product 'G', which requires 4 hours of highly skilled labour. The contribution from the sale of one unit of product L is ₹ 24.

It has also been informed that the contract would require a specialist machine. The machine could be hired for ₹ 15,000 or it could be bought for ₹ 50,000. At the end of the contract if the machine were bought, it could be sold for ₹ 30,000. Alternatively, it could be modified at a cost of ₹ 5,000 and then used on other contracts instead of buying another essential machine that would cost ₹ 45,000. The operating costs of the machine are payable by AUS whether it hires or buys the machine. These costs would total ₹ 12,000 in respect of the new contract.

Supervisor

The contract would be supervised by an existing manager who is paid an annual salary of₹ 50,000 and has sufficient capacity to carry out this supervision. The manager would receive a bonus of ₹ 5,000 for the additional work.

Development Time

15 hours of development time at a cost of ₹ 30,000 have already been worked in determining the resource requirements of the contract.

Fixed Overhead Absorption Rate

AUS uses an absorption rate of ₹ 20 per direct labour hour to recover its general fixed overhead costs. This includes ₹ 5 per hour for depreciation.

Today, 11.15 A.M: Ms. Fiona called you in her place as asked you the following:

Required

(i) CALCULATE the relevant cost of the contract to AUS. You must present your answer in a schedule that clearly shows the relevant cost value for each of the items identified above. You should also EXPLAIN each relevant cost value you have included in your schedule and why any values you have excluded are not relevant. Ignore taxation and the time value of money.

(ii) DISCUSS two problems that can arise as a result of setting prices using relevant costing.

Business Situation- 2

Today, 5.26 P.M: A memo from Managing Director of the group has been circulated to all officers of the group which stated "My objective for the forthcoming year is to reduce our quality costs in each of the primary activities in our value chain". The company is keen to build a reputation for quality and gives a five-year guarantee with all of its products.

Today, 5.37 P.M: Ms. Fiona, called you in her place and asked the following:

Required

EXPLAIN, by giving examples, how each of the four types of quality cost could be reduced. You should also IDENTIFY in which primary activity each one of your examples would occur in Aditya Group's value chain.

Solution:-

Statement Showing Relevant Cost

Type of Cost	Explanation	Amount (₹)
Material Dx (40 tonnes × ₹ 380)	1	15,200
Components	2	52,000
Direct labour (2,000 hrs. × ₹ 11)	3	22,000
Specialist machine	4	10,000
Machine operating cost	5	12,000
Supervision	6	5,000
Development time	7	Nil
General fixed overhead	8	Nil

Total relevant cost		1,16,200

Explanation

1. Material Dx is in regular use by AUS Ltd. and must be replaced. Consequently, its relevant value is its replacement cost. The historical cost is not relevant because it is a past cost and the resale value is not relevant because AUS Ltd. is not going to sell it because the material is in regular use.

2. AUS Ltd. would like to procure 4,000 components either from ANZ Ltd. or external ly from the market. At the current production level, ANZ Ltd. (seller) has available capacity to accommodate part of AUS Ltd's request to the extent of 2,500 components. At this point, ANZ Ltd. would be operating at its maximum capacity.

To cater to the remaining demand of 1,500 units from AUS Ltd., ANZ Ltd. has to forego external sales of ₹ 50,000 to its own customers. Given that the contribution to sales ratio is 40%. Therefore, ANZ Ltd. has to forego contribution of ₹ 20,000 (40% of external sales foregone ₹ 50,000) in order to cater to AUS Ltd.'s request. Fixed cost at ANZ Ltd. is irrelevant, since it would be incurred irrespective of whether AUS Ltd.'s order to catered to or not.

Therefore, in spirit of goal congruence, the transfer price that ANZ Ltd. would charge AUS Ltd. would be the variable cost of ₹ 8 per unit and ₹ 20,000 towards lost contribution as explained above. Therefore, the transfer price = (₹ 8 per unit × 4,000 components) + ₹ 20,000

= ₹ 32,000 + ₹ 20,000

= ₹ 52,000 for 4,000 components

Therefore, per component, the price charged would be ₹ 52,000 / 4,000 = ₹ 13 per component. This is lower than the external market price of ₹ 15 per unit. Therefore, in the interest of goal congruence the cheaper option is preferred. AUS Ltd. should source its components from ANZ Ltd, for a total procurement cost of ₹ 52,000.

1. Skilled labour is in short supply and can only be obtained by reducing the production of product 'G', resulting in a loss of contribution of ₹ 24 (given) or ₹ 6 per hour of skilled labour. Hence the relevant labour cost will be ₹ 6 (contribution lost per hour) + ₹ 5 (hourly rate of skilled labour) i.e. ₹ 11 per hour.
2. AUS Ltd. has a number of options: (a) If the machine were to be hired it would have a cost of ₹ 15,000; (b) if the machine were bought and then sold at the end of the work it would have a net cost of ₹ 20,000; or (c) if the machine were bought and then modified to avoid the need to buy the other machine it would have a net cost of ₹ 10,000 (₹ 50,000 plus ₹ 5,000 modifications less ₹ 45,000 cost of another machine). Thus, the most economic approach is buy the machine and then modify it so the relevant cost is ₹ 10,000.
3. The machine operating costs are future costs of doing the work and therefore are relevant.
4. The supervisor's salary is irrelevant, but the bonus needs to be included because it
5. is dependent on this work and therefore is relevant.
6. The development time has already been incurred. Therefore, it is a past cost and not relevant.

7. General fixed overhead costs and their absorption are not relevant because they will be incurred whether the work goes ahead or not. Depreciation is also not relevant because it is an accounting entry based on the historical purchase of assets. It is not affected by the work being considered.

8. Two main issues arise when pricing work based on relevant costs:

    - Profit reporting; and

    - Pricing of future work.

With regard to profit reporting, the decision as to whether to proceed with the work will have been based on the use of relevant costs, but the routine reporting of the profit from the work will be based on the company's normal accounting system. Since this system will be based on total cost, it is probable that the costs of the work reported will be greater than its relevant cost. Consequently, the amount of profit reported to have been made on this order will be lower than expected and may even be a loss. This may cause difficulties for the manager who accepted the work as an explanation will be required of the reasons why there is such a difference in profit.

With regard to the pricing of future work the difficulty lies in increasing the price for similar items for the same customer in future. Once a price is set, customers tend to expect that any future items will be priced similarly. However, where a special price has been offered based on relevant cost because of the existence of spare capacity the supplier would not be able to continue to price on that basis as it does not recover its long term total costs. There may also be difficulties created by this method of pricing as other customers are being charged on a full cost basis and if they were to discover that a lower price was offered to a new customer they would feel that their loyalty was being penalised.

Prevention

Operations: Preventative maintenance and checking of the calibration of machinery. This would reduce the number of potentially faulty products being produced and therefore reduce guarantee claims.

Appraisal

Inbound Logistics: Reduce costs of incoming inspections by building close links with suppliers and getting them to adopt TQM. If suppliers can guarantee their quality, then inbound inspections could be eliminated.

Internal Failure

Operations: Reduce costs of re-works by training employees on a continual basis e.g. quality circles. This would reduce failure costs and also improve quality.

External Failure

Service: Design quality into the product to try to prevent guarantee claims and therefore the cost of servicing/repairing the product.

Question 15:-

Angel Ltd. is a leading company in the Footwear Industry. The company has four factories in different locations with state of the art equipments. Due to competition in the market, company is continually reviewing its product range and enhancing its existing products by developing new models to satisfy the demands of its customers.

The company currently has a production facility which has a capacity of 3,500 standard hours per week.

Product 'Comfort' was introduced to the market six months ago and is now about to enter the maturity stage of its life cycle.

However, research by the marketing department indicates that demand of the product 'Comfort' in the market is price sensitive. The likely market responses are as follows:

Selling price per unit (₹)	1,750	1,600	1,525	1,450	1,300
Sales demand per week (units)	550	725	1,000	1,150	1,200

The variable cost per unit of manufacturing 'Comfort' is ₹ 750. Standard hours used to manufacture one unit is 2 hours.

Product 'Sports' was introduced to the market two months ago using a penetration pricing policy and is now about to enter its growth stage. Each unit has a variable cost of ₹ 545 and takes 2.50 standard hours to produce. Market research has indicated that t here is a linear relationship between its selling price and the number of units demanded, of the form P = a - bx. At a selling price of ₹ 1,000 per unit demand is expected to be 1,000 units per week. For every ₹ 100 increase in selling price the weekly demand will reduce by 200 units and for every ₹ 100 decrease in selling price the weekly demand will increase by 200 units.

Product 'Ethnic' is currently being developed and which is about to be launched in the market. This is a highly innovative designer product which the company believes that it will have a revolutionary impact on the market and consumer behaviour. The company has decided to use a market skimming approach to pricing this product during its introduction stage.

Required

(a) (i) ADVISE which of the above five selling prices should be charged for product 'Comfort', in order to maximize its contribution during its maturity stage.

(ii) CALCULATE the number of units to be produced of product 'Sports' in order to utilize all of the spare capacity from your answer to (i) above and the selling price per unit of product 'Sports' during its growth stage.

(b) COMPARE penetration and skimming pricing strategies during the introduction stage, using product 'Ethnic' to illustrate your answer.

(c) EXPLAIN with reasons, for each of the stages of 'Ethnic's product life cycle, the

changes that would be expected in the

i. average unit production cost
ii. unit selling price

Solution:-

(a) *(i)* **Selling Price for "Comfort" that would maximize its contribution at Maturity Stage** *Contribution per unit of "Comfort" = Selling Price per unit – Variable Cost per unit Total Contribution = Contribution per unit × Units sold*

Sales (units) per week	550	725	1,000	1,150	1,200
Selling Price per unit	1,750	1,600	1,525	1,450	1,300
Less: Variable Cost per unit	750	750	750	750	750
Contribution per unit	1,000	850	775	700	550
Total Contribution	5,50,000	6,16,250	7,75,000	8,05,000	6,60,000

Total contribution is maximum when sales are 1,150 units. Therefore, the selling price per unit of "Comfort" should be ₹ 1,450 per unit.

(ii) **Production Number of "Sports" and Selling Price per unit**

Angel Ltd. has a production capacity of 3,500 hours per week. As explained in (i) above, it would manufacture 1,150 units of "Comfort" per week. Each unit of "Comfort" requires 2 hours of production. Therefore, total production hours for Comfort would be 1,150 units × 2 hours = 2,300 hours per week.

Production capacity remaining to manufacture "Sports" = 3,500 hours – 2,300 hours = 1,200 hours per week. Each unit of "Sports" requires 2.5 hours of production.

Therefore, the number of "Sports" units that can be produced = 1,200 hours / 2.5 hours = 480 units per week.

Linear relationship between Selling Price and Number of Units Demanded has been given to be P= a – bx.

P = Selling Price per unit

a = Selling Price when demand will be zero

b (slope) = Change in Price / Change in Quantity x = Quantity Demanded

Given, at a Selling Price of ₹ 1,000 per unit, Quantity Demanded will be 1,000 units per week. For every ₹ 100, per unit increase / decrease in Selling Price, the Quantity Demanded will decrease / increase by 200 units per week respectively. A ₹ 500 per unit increase in Selling Price will result in fall of 1,000

units of Sales per week. The Selling Price at which Sales will be Zero i.e. a = ₹ 1,500 per unit.

b (slope) = Change in Price / Change in Quantity = ₹ 100 / 200 = 0.50

Penetration pricing is most commonly associated with a marketing objective of increasing market share or sales volume, rather than short term profit maximization. Thus, substituting the values in the equation to find the Sellin g Price of "Sports" when the Quantity Sold is 480 units:

$$P = a – bx$$

$$= 1,500 – 0.50 × (480)$$

$$= 1,500 – 240$$

$$= ₹ 1,260$$

Sports should be sold at ₹ 1,260 per unit during the growth stage.

(b) "Ethnic" is given to be a highly innovative product that is about to be launched into the market. The product with unique features that will differentiate it from other products leading to a revolutionary impact on market and customer behavior. There seem to be no competitors providing similar products.

Skimming Price Strategy is adopted to charge high prices in the introduction stage in order to recover costs. Skimming Price will be suitable for "Ethnic" because:

▪ Market for the product is not yet established. Initially high promotional expense may have to be incurred to create customer awareness and build a market for the product.

▪ Due to its innovative feature, the customers would not mind paying a premium for the unique product offering. Demand would be inelastic.

▪ The market demand is unknown. Initial capital outlay to produce this product may be high, resulting in high cost of production.

▪ Production and promotional costs in the initial years is likely to be high. Therefore, a higher selling price would help Angel Ltd. to recover the costs. Since demand is likely to be inelastic, charging a premium may not be a problem.

▪ The price can be gradually reduced once the market for the product is established. Competitors may reverse engineer and offer similar products, due to which price may have to be lowered in the long run to retain customers .

Penetration Pricing is adopted to charge a low price in the initial stage for penetrating the market as quickly as possible. For a new product, this low-price strategy will popularize the product. Once the market is established, the price may be increased. Penetration pricing will be suitable when:

▪ Demand for the product is elastic, more demand when prices are low.

▪ Large scale production of the product yields economies of scale.

▪ Threat of competition requires prices to be set low. It serves as an entry barrier to prospective competitors as well.

Product "Ethnic" is an innovative product that the manufacturer believes will change the whole market once it is launched. A strategy of penetration pricing could be effective in discouraging

potential new entrants to the market. However, the product is believed to be unique and as such demand is likely to be fairly inelastic. In this instance a policy of penetration pricing could significantly reduce revenue without a corresponding increase in sales. Thus, this strategy is not suitable for "Ethnic".

Impact on Unit Selling Price and Average Cost of Production per unit at each stage of "Ethnic" Product Lifecycle

Introduction Stage

As explained in (b) above, at the Introduction Stage of Lifecycle, due to high cost of production and initial promotion expenditure, the unit cost of production will be high. Using Skimming Price Policy, the unit selling price will also be high.

Growth Stage

This is the second phase of the Life-Cycle, product awareness among customers would result in increased demand. Therefore, scale of production likely to increase. The new market segment would attract competitors, who are like to reverse engineer and offer similar products in the market. Promotional activities and marketing activities need to continue to maintain and gain market share.

Accordingly, the unit selling price would reduce from the introduction stage on account of the following reasons:

- Competitors offering similar product would take away the uniqueness feature of
- "Ethnic".
- Again, to gain market share, the unit selling price may have to be lowered to make it attractive to a larger segment of customers.
- The unit cost of production is also likely to reduce due to the following reasons:
- Increased production would result in increased material procurement from suppliers. Bulk purchasing discounts can be negotiated with them to lower cost of production.
- Learning curve and experience would enable the labor force to become more efficient. This leads to higher production with the same level of resources leading to cost savings.
- Larger production batches due to increase in scale of operations will reduce the unit variable overhead cost.
- Economies of scale would result due to fixed overhead cost being spread over larger number of units.

Maturity Stage

The third phase of Product Life-Cycle that is characterized by an established market for "Ethnic". After rapid growth in sale volume in the previous stages, growth of sales for the product will saturate. Competition would be high due to large number of rivals in the market, this may lead to decreasing market share.

It is likely that the price of the product will be lowered further at the maturity stage in a bid to preserve sales volumes. The company may attempt to preserve sales volumes by employing an extension strategy rather than reducing the selling price. For example, they may introduce product add-ons to the market that are compatible with "Ethnic".

Unit production cost will remain constant

- Direct material cost will remain constant. If procurement is lower than the growth phase, it might even lead to slightly higher prices since supplier may not extend bulk discounts.

- The benefits of efficient production due to the effect of learning and experience may also have waned. Therefore, unit labour cost is also likely to remain constant.
- Since scale of production is no longer increasing, the unit variable overhead costs are also likely to remain constant.

Decline Stage

This last stage in the product cycle is characterized by saturated market, declining sales, change in customer's tastes etc. Profitability may slowly start decreasing with fall in sales.

At the decline stage, Product "Ethnic" is likely to have been surpassed by more advanced products in the market and consequently will become obsolete. The company will not want to incur inventory holding costs for an obsolete product and is likely to sell "Ethnic" at marginal cost or perhaps lower.

Sales volumes at the decline stage are likely to be low as the product is surpassed by new exciting products that have been introduced to the market. Furthermore, the workforce may be less interested in manufacturing a declining product and may be looking to learn new skills. For both of these reasons, unit production costs are likely to increase at the decline stage.

Question 16:-

Baithway India Ltd. (BIL) is an ISO 9001:2008, a premier multi-discipline company. BIL manufactures a diverse range of products viz. Pressure Vessels, Wagons, Steel Castings etc. To manufacture Wagons, BIL undertake structural fabrication jobs and manufacturing, retrofitting of EOT crane. It is presently the flagship company of the Baithway Group comprising of renowned companies such as Krishna Agriculture, Chiang Phosphate etc. The Group was launched with the idea of one virtual company with diversified businesses, and is based on four fundamental principles - Collaboration, Sustainability, Inclusiveness and being Global.

Baithway India Ltd. has two Divisions namely, Bogie Division (BD) and Wagon Division (WD) for manufacturing of Wagon. 'BD' manufactures Bogies and 'WD' manufactures various type of Wagons like Freight Wagon, Tank Wagon, Special Wagon etc. To manufacture a Wagon, 'WD' needs 4 Bogies. 'BD' is the only manufacturer of the Bogies and supplies both 'WD' and outside customers. Details of 'BD' and 'WD' for the coming financial year 2019-20 are as follows:

	BD	WD
Fixed Costs (₹)	9,20,20,000	16,45,36,000
Variable Cost per unit (₹)	2,20,000	4,80,000*
Capacity per month (units)	320	12

    * excluding transfer costs

Market research has indicated that the demands in the market for Baithway India Ltd.'s

products at different quotations are as follows-

For Bogies: Quotation price of ₹ 3,20,000 no tender will be awarded, but demand will increase by 30 Bogies with every ₹ 10,000 reduction in the unit quotation price below ₹ 3,20,000.

For Wagons: Quotation price of ₹ 17,10,000 no tender will be awarded, but the demand for Wagons will be increased by 2 Wagons with every ₹ 50,000 reduction in the unit quotation price below ₹ 17,10,000.

Further, 'BD' is the only manufacturer of Bogies but due to increased demand, competitors are entering the market. The division is reviewing its pricing policy and carrying out some market

research. After the market research, the division 'BD' has decided to introduce new type of "E" Class Bogies in the market and to obtain the patent right for such unique Bogies. High growth in future characterizes this Class.

Required

i.   CALCULATE the unit quotation price of the Wagon that will maximise Baithway India Ltd.'s profit for the financial year 2019-20.

ii. CALCULATE the unit quotation price of the Wagon that is likely to emerge if the divisional managers of 'BD' and 'WD' both set quotation prices calculated to maximise divisional profit from sales to outside customers and the transfer price is set at market selling (quotation) price.

   [Note: If P = a – bQ then MR = a – 2bQ]

iii. RECOMMEND appropriate pricing strategy while introducing the "E" Class Bogies.

Solution:-

Assumed Quotation Price 'P', Quantity 'Q' The Marginal Cost of a 'Wagon' is ₹ 13,60,000 (₹ 2,20,000 × 4 Bogies + ₹ 4,80,000)   Demand Function for a 'Wagon'

P	=	₹ 17,10,000 – (₹ 50,000 / 2) × Q
Revenue (R)	=	Q × [17,10,000 – 25,000 × Q]
	=	17,10,000 Q – 25,000 Q2
Marginal Revenue (MR)	=	17,10,000 – 50,000 Q
Marginal Cost (MC)	=	13,60,000

17,10,000 – 50,000 Q   =   13,60,000

                Q   =   7.00 units

By putting the value of 'Q' in Demand Function, value of 'P' is obtained.

          P   =   17,10,000 – (50,000/ 2) × Q

              =   17,10,000 – 25,000 × 7.00

              =   ₹ 15,35,000

At ₹ 15,35,000 unit Quotation Price of a Wagon, the Baithway Company Ltd.'s Profit will

be Maximum.

(ii) At 'BD' the Divisional Manager would ensure that Divisional Marginal Revenue should be equal to Division's Marginal Cost so that Profit can be Maximum.

MR of a Bogies	=	MC of Manufacturing a Bogies
3,20,000 – 2(10,000/ 30) × Q	=	2,20,000
Q	=	150 units
Selling Price of a Bogie i.e 'P' is		
P	=	3,20,000 – (10,000/ 30) × 150
	=	₹ 2,70,000

BD' will earn Maximum Profit when it will Quote ₹ 2,70,000 to the Outside Market. Since, Outside Market Quotation is Transfer Price as well, so Transfer Price to WD will be ₹ 2,70,000 and it forms part of WD's Marginal Cost.

At 'WD', Division Manager would ensure that Divisional Marginal Revenue should be

equal to Division's Marginal Cost so that Profit can be Maximum.

MR of a Wagon	=	MC of Manufacturing a Wagon
17,10,000 – 50,000 × Q	=	(2,70,000 × 4 Bogies) + ₹ 4,80,000
Q	=	3.00 units
Quotation Price of a Wagon 'P' should be:		
P	=	₹ 17,10,000 – 25,000 × 3.00
	=	₹ 16,35,000

The unit Quotation Price of Wagon that emerges as a result of Market Based Transfer Pricing is ₹ 16,35,000.

(ii) Whenever a new product is launched into the market, management can adopt either Skimming or Penetration strategy.

The idea behind Skimming Strategy is to intentionally keep a price high to recover the high R&D and marketing expenses associated with developing a new product. For Price Skimming to work, the product must be perceived as having unique advantage over its competing products, very difficult to copy or protected by patents.

Division 'BD' may follow Skimming Strategy by taking advantage of the distinctive features of Bogie "E". High prices in the early stages of a Bogies' life cycle are expected to generate high initial cash flows, this will help the division to recover the high development costs it would incur. Further, this new Bogie "E" is protected from competition through entry barrier. Such barrier is patent.

With Penetration Strategy, a low price is initially charged for the product rather than high prices. The idea behind this is that the price will make the product accessible to many buyers and therefore the high sales will compensate for the lower prices being charged. This penetration pricing is adopted for rapid market acceptance, maximum sales and discouraging competition from the market, however this strategy is not for all companies since it requires a cost structure and scale economics that remain unaffected by narrow profits margin.

The circumstances which may favor a penetration pricing policy are:

– Highly elastic demand for the product, i.e. the lower the price, the higher the demand. This situation is not mentioned in this case for Bogies "E".

– If significant economies of scale could be achieved so that higher sales volumes would result in reductions in costs. However, in this case, it cannot be ascertained.

– Where entry barriers are low, however in this case, new competitors cannot enter the market as Bogies "E" is protected by patent.

– If company desires to shorten the initial period of the product's life-cycle to enter the growth and maturity stages quickly, however, there is no evidence the division 'BD' wish to do this.

Overall, Due to the uniqueness, heavy R&D cost, and barrier to entry for competitor, a market skimming pricing strategy is appeared to be the more appropriate pricing strategy for Bogie "E".

Question 17:–

The budgeted cost data of a product manufactured by Ayudhya Ltd. is furnished as below:

Budgeted units to be produced	2,00,000

| Variable cost (₹) | 32 per unit |
| Fixed cost (₹) | 16 lacs |

It is proposed to adopt cost plus pricing approach with a mark-up of 25% on full budgeted cost basis.

However, research by the marketing department indicates that demand of the product in the market is price sensitive. The likely market responses are as follows:

| Selling Price (₹ per unit) | 44 | 48 | 50 | 56 | 60 |
| Annual Demand (units) | 1,68,000 | 1,52,000 | 1,40,000 | 1,28,000 | 1,08,000 |

Required

ANALYSE the above situation and DETERMINE the best course of action.

Solutiobn:-

Analysis of Cost plus Pricing Approach

The company has a plan to produce 2,00,000 units and it proposed to adopt Cost plus Pricing approach with a markup of 25% on full budgeted cost. To achieve this pricing policy, the company has to sell its product at the price calculated below:

Qty.	2,00,000 units
Variable Cost (2,00,000 units × ₹ 32)	64,00,000
Add: Fixed Cost	16,00,000
Total Budgeted Cost	80,00,000
Add: Profit (25% of ₹ 80,00,000)	20,00,000
Revenue (need to earn)	1,00,00,000
Selling Price per unit $\left(\frac{Rs.1,00,00,000}{2,00,000\ units}\right)$	50 p.u.

However, at selling price ₹ 50 per unit, the company can sell 1,40,000 units only, which is 60,000 units less than the budgeted production units.

After analyzing the price-demand pattern in the market (which is price sensitive), it is perceived that to sell all the budgeted units of 2,00,000 market price needs to be further lowered, which might be lower than the total cost of production. This action does not seem to be in favor of firm's interest.

Statement Showing "Profit at Different Demand & Price Levels"

	I	II	III	IV	Budgeted
Qty. (units)	1,68,000	1,52,000	1,40,000	1,28,000	1,08,000
	₹	₹	₹	₹	₹
Sales	73,92,000	72,96,000	70,00,000	71,68,000	64,80,000
Less: Variable Cost	53,76,000	48,64,000	44,80,000	40,96,000	34,56,000
Total Contribution	20,16,000	24,32,000	25,20,000	30,72,000	30,24,000
Less: Fixed Cost	16,00,000	16,00,000	16,00,000	16,00,000	16,00,000
Profit (₹)	4,16,000	8,32,000	9,20,000	14,72,000	14,24,000

Profit (% on total cost)	5.96	12.87	15.13	25.84%	28.16%

Determination of the Best Course of Action

(i) Taking the above calculation and analysis into account, the company should produce and sell 1,28,000 units at ₹ 56. At this price company will not only be able to achieve its desired mark up of 25% on the total cost but can earn maximum contribution as compared to other even higher selling price.

If the company wants to uphold its proposed pricing approach with the budgeted quantity, it should try to reduce its variable cost per unit for example by asking its supplier to provide a quantity discount on the materials purchased. With reduction in variable cost per unit, the selling price per unit (determined as a percentage of full costs) will also reduce and suitably create demand for 2,00,000 units as budgeted.

Question 18:-

Y" Limited has three autonomous divisions. The divisions are evaluated on the basis of ROI, with yearend bonuses given to divisional managers who have the highest ROI. Operating results of Division II for the last year are given below:

	₹
Sales	2,10,00,000
Less: Variable Expenses	1,26,00,000
Contribution margin	84,00,000
Less: Fixed Expenses	67,20,000
Net Operating Income	16,80,000
Divisional Operating Assets	52,50,000

The company's overall ROI for the last year was 18% (considering all divisions). Division II has an opportunity to add a new product line that would require an investment of ₹ 30,00,000. Other details of the new product line are as follows:

	₹
Sales	₹ 90,00,000 per annum
Variable Expenses	65% of sales
Fixed Expenses	₹ 25,20,000 per annum
Life cycle of the product line	5 years

Required

  i.   CALCULATE last year's ROI of Division II.

  ii.   DISCUSS whether the manager of Division II would accept or reject the new product line, if he takes his decision based solely on divisional ROI.

  iii. ADVISE how residual income approach can be used as an alternative financial measure for evaluation of managerial performance in the best interest of the company.

Solution:-

1. (i) **Calculation of last year ROI of Division II**

   = Controllable Profit/ Controllable Net Asset

   = ₹ 16,80,000/ ₹ 52,50,000

   = 32%

2. **Calculation of ROI of New Product Line**

Particulars	Amount (₹)
Sales	90,00,000
Less: Variable Cost	58,50,000
Controllable Contribution	31,50,000
Less: Fixed Cost	25,20,000
Controllable Profit	6,30,000
Investment Available	30,00,000
Return on the Proposed Line (ROI)	21%

The manager of Division II will reject investment proposal (Invest additional ₹ 30 lacs in new product line) because this would decrease the Division II's ROI of 32% to 28%*.

(*) 28% = (₹ 16,80,000 + ₹ 6,30,000) / (₹ 52,50,000 + ₹ 30,00,000)

Note – Divisional performance measures have certain issues, one among them is lack of goal congruence between divisions and organisation as a whole. The divisional managers are forced to choose between the best interests of their division (because their individual performance is linked division performance) and the best interests of the company as a whole. It is obvious, a manager who is evaluated based on ROI will reject any project whose rate of return is below the division's current ROI even if the rate of return of the project is above the company's minimum required rate of return. In present case too investment proposal with ROI of 21% which above organisation wide ROI i.e. 18%. This will give birth to situation of sub-optimisation.

(ii) RI is capable to overcome the inherent shortcoming of ROI. If divisional managers are evaluated using residual income then every such investment proposal will be acceptable whose rate of return is above the minimum required rate of return, because it will increase their residual income. Hence if decision is based upon RI rather ROI, division II will accept the proposal to invest additional capital of 30 lacs, because it will fetch them 21% which more than 18% the required rate of return; in the best interest of the company as a whole because capable to add ₹ 90,000 each year for next 5 year to profit of company

Working Note – Calculation of RI for division II (from proposed investment).

Particulars	Amount in ₹
Controllable Profit	6,30,000
Cost of Capital (18%)	5,40,000

Residual Income (RI)	90,000

Note – Where RI is capable to overcome the sub optimisation but has its own shortcomings. Being an absolute measures RI is not capable to compare the performance of divisions which are different in size.

Alternative

To overcome the dysfunctional consequences of ROI, the residual income approach can be used. For the investment decision for Divisions II, the residual income calculations are as follows:

Proposed Investment	₹ 30,00,000
Controllable Profit	₹ 6,30,000
Cost of Capital (18%)	₹ 5,40,000
Residual Income (RI)	**₹ 90,000**

Advise

This calculation indicates that the residual income of Division II will increase if manager accept the project. However, it is important to note that Residual Income does not always point to the right decision, because notional interest on accounting capital employed is no t the same as IRR on cash investment.

This Project has 1.65% IRR.

Overall, Residual Income is more likely than ROI to improve when managers make correct investment decisions, and so is probably a 'safer' basis than ROI on which to measure performance.

Question 19:–

BYD Alloy Ltd. first opened its door in 1991 for business and now it is a major supplier of metals supporting over a dozen different industries and employs experts to support each industry. These include Wood & Panel Products Manufacturing, Hearth Products, Site Furnishings, Commercial and Residential Construction etc. It has grown through devotion to its customers, dedication to customer service and commitment to quality products. The company has two divisions: Division 'Y' and Division 'D'. Each division work as an investment centre separately. Salary of each divisional manager is ₹ 7,20,000 per annum with the addition of an annual performance related bonus based on divisional return on investment (ROI). A minimum ROI of 12% p.a. is expected to be achieved by each divisional manager. If a manager only achieves the 12% target, he will not be rewarded a bonus. However, for every whole 1% point above 12% which the division achieves for the year, a bonus equal to 3% of annual salary will be paid subject to a maximum bonus of 20% of annual salary. The figures belonging to the year ended 31 March 2021 are given below:

	Division 'Y' ('000)	Division 'D' ('000)

Revenue	29,000	17,400
Profit	5,290	3,940
Less: Head Office Cost	(2,530)	(1,368)
Net Profit	2,760	2,572
Non- Current Assets	19,520	29,960
Cash, Inventory, and Trade Receivable	4,960	6,520
Trade Payable	5,920	2,800
Manager Responsible	HAI	FAI

During the financial year 2020-21, FAI manager of Division 'D' invested ₹ 13.6 million in new equipment including an advanced cutting machine, which will increase productivity by 10% per annum. HAI, manager of Division 'Y', has made no investment during the year, even its computer system needs updation. Division 'Y''s manager has already delayed payments of its suppliers due to limited cash & bank balance although the cash₹ balance at Division 'Y' is still better than that of Division 'D'.

Required
I.   For each division, COMPUTE, ROI for the year ending 31 March 2021. JUSTIFY the figures used in your calculation.
II. COMPUTE bonus of each manager for the year ended 31 March 2021.
III. DISCUSS whether ROI provides justifiable basis for computing the bonuses of managers and the problems arising from its use at BYD for the year ended 31 March 2021.

Soluion:-

(I) ROI
Division 'Y'

Controllable Profit = ₹ 5,290K

Net Assets = ₹ 19,520k + ₹ 4,960K – ₹ 5,920K = ₹ 18,560K ROI = 28.50%

Division 'D'

Controllable profit = ₹ 3,940K

Net Assets = ₹ 29,960K + ₹ 6,520K – ₹ 2,800K = ₹ 33,680K ROI = 11.70%

Responsibility accounting advocates that manager's performance shall be judged based upon how well he or she manages the items under his or her control, hence in computation of ROI of both division, controllable profit has been taken into consideration; because head office costs are not controllable by divisional managers. Figures of Non-current and current assets apart from the current liabilities have

been taken into consideration as they are such items over which divisional managers have complete control.

(II) Bonus

Bonus to be paid for each whole percentage point is ₹ 21,600 (₹ 7,20,000 × 3%), But there is ceiling limit as well, i.e. 20% of salary hence the maximum Bonus will be ₹ 1,44,000 (₹ 7,20,000 × 20%).

Division 'Y'

Divisional ROI is 28.5%, which result in 16 whole percentage points above the minimum required ROI of 12%. Hence the bonus according to each whole percent of excess ROI will be ₹ 3,45,600 (16 × ₹ 21,600). But there is upper cap of ₹ 1,44,000 Therefore HAI will be paid the bonus of ₹ 1,44,000.

Division 'D'

Divisional ROI is 11.7%, since same is less than the minimum required ROI of 12%, hence FAI will not be rewarded with bonus.

(III) Discussion

FAI will not receive any bonus since he has not earned any point above minimum percentage. This is due to the larger investment base on which the ROI figure has been computed. Total investment of Division 'D' are almost 1.81 times to that of Division 'Y'. The major reason behind this is that Division 'D' invested ₹ 13.6 million (₹ 13,600K) in new equipment during the year. Ignoring this investment of division D is just 1.1. times to that of division Y and net Investments would have been only ₹ 20,080K and the ROI for Division 'D' would have been 19.62% resulting in payment of a bonus ₹ 1,44,000 (7 × ₹ 21, 600 i.e. ₹ 1,51,200 but subject to upper cap of ₹ 1,44,000) rather than the nothing. So, FAI is being penalized for making investment decisions which are in the best interests of his division and company, because new investment enhance productivity which will support customer loyalty, dedication to customer services and quality, the CSFs for BYD. It is very surprising that he decided to invest where he knew that he would receive lesser bonus subsequently. On the other hand, HAI has taken benefit from the fact that he has not invested anything even though it was needed for computer system updation. This is an example of sub-optimal decision making.

Further, Division 'Y''s trade payables are more than double those of Division 'D'. In part, one would expect this due to higher sales (almost 66% more than Division 'D') and low cash levels at Division 'Y'. Higher trade payable leads to reduction in net assets figures. The fact that BYD is rewarding HAI with bonus, even though relationships with suppliers may be badly affected, is again a case of sub-optimal decision making.

If the profit margin (excluding head office cost) as percentage of sales is calculated, it comes to 18.24% (₹ 5,290 / ₹ 29,000) for division 'Y' and 22.64% (₹ 3,940 / ₹ 17,400) for division 'D'. Therefore, it can be seen that division 'D' is performing better if capital employed is ignored. ROI is simply distorting the division 'D''s performance.

FAI might feel extremely disappointed by getting nothing and in the future, he may opt to postpone the investment to increase the bonus. Non- investing in new technology and equipment will mean that the BYD will not be kept updated with industry changes and its overall future competitiveness will be affected.

Briefly, the use of ROI is resulting in sub-optimal decision making and a lack of goal congruence i.e.

what is good for the managers is not necessarily good for the company too and vice versa. Hence ROI is not justifiable basis to for computing the bonuses of divisional managers and also cause problem for BYD.

Question 20:–

X Greetings is a Korean company based in Seoul committed to supplying the highest quality stationery, greeting cards, gifts, and children's products, which are sourced from all over the world. Company also distributes Sunday Paper – Korean made eco-friendly stationery designed and manufactured in Seoul. X's home currency is the KRW. It is also listed on the KRX for last 20 years and its current share price is KRW 23.25.

You are a Management Accountant of the X Greetings and directors have asked you to study X on value-based management which is a different approach to the performance management. The directors have heard about this method considering it a way of focusing on shareholder's interests and in the present economic scenario, they think it to be useful for the growth of X.

Conventionally earnings per share (EPS) and share price were being used to assess performance. The proposed changes are important and the directors require you to have the implications of the new analysis and also want to convince the major investors for the future benefits.

Financial data for X Greetings

Particular	2020-21	2019-20
	KRW in million	KRW in million
Profit after interest and tax	55.55	65.38
Interest	15.60	8.00
Opening capital employed	273.58	198.40
Closing capital employed	329.13	273.58
	Debt to Equity	Debt to Equity
Capital structure	40:60	40:60
	%	%
Costs of capital		
Equity	14.20	11.50
Debt (pre-tax rate)	8.00	6.00
Tax rate	30	30
Stock market information:		
Average number of shares in issue	3.2 million	3.2 million
Stock market all-share index	1,985	2,561
Retailing sector index	1,155	1,408
X Greetings (share price)	KRW 22.50	KRW 24.40

Required

ASSESS the performance of X Greetings using Economic Value Added and ANALYSE the result relative to

those of earnings per share (EPS) and share price. Assumptions, if any, should be clearly stated.

Solution:-

Conventionally the X Greetings considered EPS and Share Price as performance measure, but management has shown interest in using EVA as performance measure now.

EPS - The performance of X Greetings has gone down since earnings per share is down by 15.03% (WN2) from last year. This indicates the company is not performing well and it is not in the favor of investors to continue with their investment in X Greetings or invest further.

Share Price and Index - However, the share price seems relatively better than of sector and stock market as whole. The share price of X Greeting declined by 7.79% in comparison to 17.97% decline in retailing sector index and 22.49% decline in Stock Market all -share index (WN3). The sector comparison is relevant for determining the performance of X Greetings rather stock market all-share index. According to this measure, performance of X Greetings is acceptable, because it registered comparatively less destruction of market-cap.

This implies that the within retailing sector X Greetings is seen as company with better prospects and this will encourage the shareholders to continue to hold their shares in the company.

EVA - X Greetings has generated positive EVA KRW 37.03 million during 2020-21 and same is less then what it earns during year ago (KRW 53.96 million) (WN1). No doubt EVA falls by around 31% over a year, but still positive; means value is generated. Hence performance is acceptable.

To Conclude, even in the bearish market X Greetings is capable to generate value for fund providers including shareholders hence performance of X Greetings is acceptable can be consider as good investment option.

Working Note-1 (EVA)

EVA calculations for the periods given are:

Particulars	2020-21 KRW in million	2019-20 KRW in million
Profit after interest and tax	55.55	65.38
Add Back: Interest (net of tax at 30%)	10.92	5.60
Net operating profit after tax (NOPAT)	66.47	70.98
Opening Capital employed	273.58	198.40

Assumptions

– There are no non-cash expenses to adjust the profit.

– Economic depreciation and Accounting depreciation are equal.

– No lease exists for capitalisation. Cost of Capital

WACC 2020-21 = 0.60 × 14.20% + 0.40 × 5.60%

= 10.76%

WACC 2019-20 = 0.60 × 11.50% + 0.40 × 4.20%

= 8.58%

EVA = NOPAT – Capital Employed × WACC

EVA 2020-21 = 66.47 m – 273.58 m × 10.76%

= KRW 37.03 m

EVA 2019-20 = 70.98 m – 198.40 m × 8.58%

= KRW 53.96 m

Working Note-2 (EPS)

Particulars	2020-21	2019-20	Change
EPS	KRW 17.36	KRW 20.43	-15.03%

Working Note-3 (Index and Share Price Movement)

Particulars	2020-21	2019-20	Change
KOSPI (capitalization-weighted index of all common shares)	1,985	2,561	-22.49%
Retailing sector index	1,155	1,408	-17.97%
X share price	KRW 22.50	KRW 24.40	-7.79%

Question 21:–

ABC miners operates two divisions, one in Japan and other in United Kingdom (U.K.). Mining Division is operated in Japan which is rich in raw emerald.

The other division is United Kingdom Processing Division. It processes the raw emerald into polished stone fit for human wearing.

The cost details of these divisions are as follows:

Division	Japan Mining Division	United Kingdom Processing Division
	Per carat of raw emerald	Per carat of polished emerald
Variable Cost	2,500 Yen	150 Pound
Fixed Cost	5,000 Yen	350 Pound

Several polishing companies in Japan buy raw emerald from other local Mining Companies at 9,000 Yen per carat. Current Foreign Exchange Rate is 50 yen = 1 Pound. Income Tax rates are 20% and 30% in Japan and the United Kingdom respectively.

It takes 2 carats of Raw Yellow emerald to yield 1 carat of Polished Stone. Polished emerald sell for 3,000 Pounds per carat.

Required

I.   COMPUTE the transfer price for 1 carat of raw emerald transferred from Mining Division to the Processing Division under two methods - (a) 200% of Full Costs and (b) Market Price.

II.   1,000 carats of raw emerald are mined by the Japan Mining Division and then processed and sold by the U.K. Processing Division. COMPUTE the after tax operating income for each division under both the Transfer Pricing Methods stated above in (i).

Solution

(i)   Transfer Price: 200% of Full Cost Basis

= 200% of (¥ 2,500 + ¥ 5,000)

= ¥ 15,000 or £300 (¥ 15,000/ 50)

Transfer Price: Market Price Basis

= ¥ 9,000 or £180 (¥ 9,000/ 50)

Statement Showing "Operating Income"

Particulars	Japan Mining Division		UK Processing Division	
	Transfer Price		Transfer Price	
	¥15,000	¥9,000	£300	£180
Selling Price (Polished Stone)	---	---	£3,000	£3,000
Transfer Price (Raw Emerald)	¥ 15,000	¥ 9,000	---	---
Raw Emerald	---	---	£600 (£300 × 2)	£360 (£180 × 2)
Variable Cost	¥ 2,500	¥ 2,500	£150	£150
Fixed Cost	¥ 5,000	¥ 5,000	£350	£350
Profit Before Tax	¥ 7,500	¥ 1,500	£1,900	£2,140
Less: Tax 20%/ 30%	¥ 1,500	¥ 300	£570	£642
Profit After Tax per Carat of Raw Emerald	¥ 6,000	¥ 1,200	£1,330	£1,498
Raw Emerald	1,000 Carats	1,000 Carats	500 Carats	500 Carats
Total Profit	¥ 60,00,000	¥ 12,00,000	£6,65,000	£7,49,000
	Or	Or		
Total Profit (£)	£1,20,000	£24,000	£6,65,000	£7,49,000

Question 22:–

Centurion Co. operates a Pulp Division that manufactures Wood Pulp for use in production of various paper goods. The following information are available:

₹	
Selling Price	210
Less: Variable Expenses	126
Contribution	84
Less: Fixed Expenses (based on a capacity of 1,00,000 kgs	54

per year)	
Net Income	30

Centurion Co. has just acquired a small company that manufacturers paper cartons. This company will be treated as a division of Centurion with full profit responsibility. The newly formed Carton Division is currently purchasing 10,000 kgs of pulp per year from supplier at a cost of ₹ 210 per kg less a 10% quantity discount. Centurion's President is anxious that the Carton Division begins purchasing its pulp from the Pulp Division if an acceptable transfer price can be worked out.

Situation I

If the Pulp Division is in a position to sell all of its pulp to outside customers at the normal price of ₹ 210 per kg, will the Managers of the Carton and Pulp Division agree to transfer 10,000 kgs of pulp next year at a determined price? EXPLAIN with reasons.

Situation II

Assuming that the Pulp Division is currently, selling only 60,000 kgs of pulp each year to outside customers at the stated price of ₹ 210 per kg will the Managers agree to a mutually acceptable transfer price for 10,000 kgs of pulp in next year? EXPLAIN with reasons.

Situation III

If the outside supplier of the Carton Division reduces its price to ₹ 177 per kg, will the Pulp Division meet this price? EXPLAIN. If the Pulp Division does not meet the price of ₹ 177 per kg, what will be the effects on profits of the company as a whole?

Solution:-

Situation I

The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

Transfer price Variable cost + Total contribution margin on lost sales

Number of units transferred

The Pulp Division has no idle capacity, so transfers from the Pulp Division to the Carton Division would cut directly into normal sales of pulp to outsiders. Since the costs are the same whether the pulp is transferred internally or sold to outsiders, the only relevant cost is the lost revenue of ₹ 210 per kg from the pulp that could be sold to outsiders. This is confirmed below

Transfer Price ≥ ₹ 126 + (₹ 210 - ₹ 126) ×10,000 = ₹ 210

10,000

Therefore, the Pulp Division will refuse to transfer at a price less than ₹ 210 per kg.

The Carton Division can buy pulp from an outside supplier for ₹ 210 per kg, less a 10% quantity discount of ₹ 21, or ₹ 189 per kg. Therefore, the Division would be unwilling to pay more than ₹ 189 per kg.

Transfer Price ≤ Cost of Buying from Outside Supplier = ₹ 189

The requirements of the two divisions are incompatible. The Carton Division won't pay more than

₹ 189 and the Pulp Division will not accept less than ₹ 210. Thus, there can be no mutually agreeable

transfer price and no transfer will take place.

Situation II

The Pulp Division has idle capacity, so transfers from the Pulp Division to the Carton Division do not cut into normal sales of pulp to outsiders. In this case, the minimum price as far as the Carton Division is concerned is the variable cost per kg of ₹ 126. This is confirmed in the following calculation:

Transfer price ≥ Rs. 126 $+ \frac{Rs. 0}{10,000}$ = Rs. 126

The Carton Division can buy pulp from an outside supplier for ₹ 189 per kg and would be unwilling to pay more than that for pulp in an internal transfer. If the managers understand their own businesses and are cooperative, they should agree to a transfer and should settle on a transfer price within the range:

₹ 126 ≤ Transfer price ≤ ₹ 189

Situation III

Yes, ₹ 177 is a bona fide outside price. Even though ₹ 177 is less than the Pulp Division's ₹ 180 "full cost" per unit, it is within the range and therefore will provide some contribution to the Pulp Division.

If the Pulp Division does not meet the ₹ 177 price, it will lose ₹ 5,10,000 in potential profits.

Price per kg	₹ 177
Less: Variable Costs	₹ 126
Contribution margin per kg	₹ 51

10,000 kgs × ₹ 51 per kg = ₹ 5,10,000 potential increased profits.

This ₹ 5,10,000 in potential profits applies to the Pulp Division and to the company as a whole.

Question 23:–

APC Ltd. has two divisions- Division X and Division Y with full profit responsibility. Division X produces components 'Gex' which is supplied to·both division Y and external customers.

Division Y produces a product called 'Gextin' which incorporates component 'Gex'. For one unit of 'Gextin' two units of component 'Gex' and other materials are used.

Till date, Division Y has always bought component 'Gex' from division X at ₹ 50 per unit since the lowest price at which the component 'Gex' could have been bought by Division Y was ₹ 52 per unit.

Division X charges the same price for component 'Gex' to both division Y and external customers. However, it does not incur selling and distribution costs when transferring internally.

Division Y has received a proposal from a new supplier who has offered to supply component 'Gex' for ₹ 47 per unit at least for the next three years.

Manager of Division Y requests the manager of Division X to supply component 'Gex' at or below, ₹ 47 per unit. Manager of Division X is. not ready to reduce· the transfer price since the divisional performance evaluation is done based on profit margin ratio of the division.

The following additional information is made available to you :

	Component 'Gex'₹	Product 'Gextin'₹
Selling Price per unit	50	180

Less: Variable Costs		
Direct Materials		
Component 'Gex'	-	100
Other materials	12	22
Direct labour	16	13
Manufacturing Overhead	2	5
Selling and Distribution Costs	4	2
Contribution per unit	16	38
Annual fixed costs	₹ 40,00,000	₹ 20,00,000
Annual external demand (units)	3,00,000	1,20,000
Capacity of plant (units)	5,00,000	1,50,000

Required

(i) CALCULATE the present profit of each division and the company as a whole.

(ii) ANALYSE the impact on the total annual profits of each division and the company as a whole if Division Y accepts the offer of the new supplier.

(iii) In the changed scenario, DISCUSS why the top management should intervene and advise a suitable transfer price for component 'Gex' for resolving transfer pricing conflict which promotes goal congruence through efficient performance of the concerned division.

Solution:-

Profitability of each division and the company as a whole when Division X supplies 240,000 units of Gex annually to Division Y.

Division Y produces 1,20,000 units of Gextin. Each component of Gextin requires 2 components of Gex that it currently procures from Division X. Therefore, it procures 2,40,000 units of Gex from Division X annually.

Division X has an overall capacity of 5,00,000 units annually to produce Gex. Of this it produces 2,40,000 units for Division Y, which it must first **cater** to. The remaining 2,60,000 units of Gex is sold to external customers.

Divisional and Overall Profitability of APC Ltd.

Sr. No.	Particulars	Division X				Division Y		Total APC Ltd
		Per unit of Gex	External Sales	Internal Sales	Total Division X	Per unit of Gextin	External Sales	
			2,60,000 units	2,40,000 Units	5,00,000 Units		1,20,000 units	
1	Selling Price	50	1,30,00,000	1,20,00,000	2,50,00,000	180	2,16,00,000	4,66,00,000

Strategic Cost and Performance Management

Sr. No.	Particulars	Div X Per unit of Gex	Div X External Sales	Div X Internal Sales	Div X Total Division X	Div Y Per unit of Gextin	Div Y External Sales	Total
2	Less: Variable Cost							
a	Direct Material							
b	Component Gex	---	---	---	---	100	1,20,00,000	1,20,00,000
c	Other materials	12	31,20,000	28,80,000	60,00,000	22	26,40,000	86,40,000
d	Direct Labour	16	41,60,000	38,40,000	80,00,000	13	15,60,000	95,60,000
e	Manufacturing Over-head	2	5,20,000	4,80,000	10,00,000	5	6,00,000	16,00,000
f	Selling and Distribution Costs	4	10,40,000	----	10,40,000	2	2,40,000	12,80,000
	Total	34	88,40,000	72,00,000	1,60,40,000	142	1,70,40,000	3,30,80,000
3	Contribution (Step 1 - 2)	16	41,60,000	48,00,000	89,60,000	38	45,60,000	1,35,20,000
4	Annual Fixed Cost				40,00,000		20,00,000	60,00,000
5	Annual Profit (Step 3 - 4)				49,60,000		25,60,000	75,20,000

Note

Division X does not incur marketing costs on internal sales. Therefore, cost not incurred on transfer of 240,000 units to Division Y.

Impact if Division Y accepts to buy 240,000 units of Gex annually from the external supplier at ₹ 47 per unit of Gex.

Sr. No.	Particulars	Division X Per unit of Gex	Division X External Sales	Division X Internal Sales	Division X Total Division X	Division Y Per unit of Gextin	Division Y External Sales	Total
			3,00,000 units	0 Units	3,00,000 units		1,20,000 units	
1	Selling Price	50	1,50,00,000	-	1,50,00,000	180	2,16,00,000	3,66,00,000
2	Less: Variable Cost							
a	Direct Material							
b	Component Gex	-	-	-	-	94	1,12,80,000	1,12,80,000

c	Other Materials	12	36,00,000	-	36,00,000	22	26,40,000	62,40,000
d	Direct Labour	16	48,00,000	-	48,00,000	13	15,60,000	63,60,000
e	Manufacturing Overhead	2	6,00,000	-	6,00,000	5	6,00,000	12,00,000
f	Selling and Distribution Costs	4	12,00,000	-	12,00,000	2	2,40,000	14,40,000
	Total	34	1,02,00,000	-	1,02,00,000	136	1,63,20,000	2,65,20,000
3	Contribution (Step 1 - 2)	16	48,00,000	-	48,00,000	44	52,80,000	1,00,80,000
4	Annual Fixed Cost				40,00,000		20,00,000	60,00,000
5	Annual Profit (Step 3 - 4)				8,00,000		32,80,000	40,80,000

Analysis APC Ltd

Overall profitability of APC Ltd. reduces from ₹ 75,20,000 per annum to ₹ 40,80,000 per annum. The reduction in profit is therefore ₹ 34,40,000 per annum. Reasons are:

a) The cost of manufacturing Gex is only ₹ 30 per unit while Division Y is procuring this at ₹ 47 per unit from an external supplier. Annually this results in a loss of ₹ 40,80,000 (240,000 units of Gex×₹ 17 per unit).

b) Since Division X no longer makes Gex for internal sales, it can ramp up its external sales to meet the full annual demand of 300,000 units. This results in extra external sales of 40,000 units annually. Each unit gives a contribution of ₹ 16 per unit. Therefore, additional contribution from sale of 40,000 units of Gex to external customers is ₹ 640,000 per annum.

c) Therefore, netting both (a) and (b) above, the net loss to the company is ₹ 34,40,000 per annum.

Division Y

Impact on profit of Division Y, increase from ₹ 25,60,000 per annum to ₹ 32,80,000 per annum that is ₹ 7,20,000 per annum increase. This is due to the savings in procurement cost of Gex for Division Y. Instead of procuring Gex at ₹ 50 per unit Division Y proposes to buy it at ₹ 47 per unit externally. For its annual demand of 2,40,000 units of Gex , it translates to savings of ₹ 7,20,000 annually in procurement cost for Division Y.

Division X

Impact on profit of Division X, reduction from ₹ 49,60,000 per annum to ₹ 8,00,000 per annum. A substantial reduction of ₹ 41,60,000 in its divisional profit per year. Division X earns a contribution of ₹ 20 per unit of Gex from its internal transfer to Division Y. (Selling price ₹ 50 per unit less variable cost of manufacturing ₹ 30 per unit). If Division Y procures Gex externally, this would result in an annual loss of ₹ 48,00,000 in contribution for Division X (240,000 units ×₹ 20 per unit). However, due to additional external sales of 40,000 units of Gex, Division X can earn an additional contribution of ₹ 6,40,000 per year (40,000 units of Gex × ₹ 16 contribution per unit of external sale). Offsetting, this

results in a lower contribution of ₹ 41,60,000 per annum for Division X.

This also results in excess capacity of 2,00,000 units per annum in Division X.

(ii) APC Ltd. can suffer a loss of ₹ 34,40,000 per annum if Division Y decides to procure Gex from the external supplier. It costs on ₹ 30 per unit to manufacture Gex internally as compared to ₹ 47 per unit that Division Y is willing to pay to the external supplier. However, Division X is unwilling to reduce the price from ₹ 50 per unit since divisional performance is done based on the profit margin ratio of the division. Therefore, the management of the company has to step in to promote goal congruence. If Division Y buys GEX from the external supplier, not only is it costly for the company, it also results in a lot of unused capacity lying idle in Division X.

In the current scenario, one possible way of arriving at an acceptable transfer price range could be:

Division X is currently working at full capacity of 5,00,000 units per annum. Of this production, 2,40,000 units is supplied internally to Division Y while the balance is supplied to external market. The marginal cost of production of Gex is ₹ 30 per unit. If this were sold externally, it would earn a contribution of ₹ 16 per unit. Therefore, the minimum transfer price the Division X would demand = marginal cost of production per unit + opportunity cost per unit = ₹ 30 + ₹ 16 = ₹ 46 per unit of Gex.

(The other way of looking at this could also be that Division X does not incur any selling and distribution costs on internal transfers. To outside clients it needs to spend ₹ 4 per unit towards the same. Therefore, to make its price more competitive with the external market, Division X can reduce the price by ₹ 4 per unit, which it has been recovering from Division Y for a cost it does not incur in internal transfers. Thus, based on its cost structure and the competitive profit margin it earns from external sales, it can price its internal transfers at ₹ 46 per unit.)

Division Y will be willing to pay the lower of net marginal revenue or the external buy-in price.

The Net Marginal Revenue per unit of Gextin = Selling price per Gextin – (marginal cost for Division Y other than the cost of Gex) = ₹ 180 - ₹ 42 = ₹ 138 per unit of Gextin. This translates that Division Y will be willing to pay upto ₹ 69 per unit of Gex, that it can incur without incurring a divisional loss. Meanwhile, the external buy-in price is ₹ 47 per unit.

Therefore, the maximum price Division Y will be willing to pay = lower of Net Marginal Revenue or external buy-in price = lower of ₹ 69 or ₹ 47 per unit of Gex. Therefore, Division Y will be willing to pay maximum ₹ 47 per unit of Gex to Division X.

Therefore, the transfer price range can be set between ₹ 46 - ₹ 47 per unit of Gex. Division X would then have to compete with the external supplier to retain its internal sales. This would promote more efficient working between Division X and Y. By selling it at ₹ 46 per unit, the contribution of Division X would be maintained at ₹ 16 per unit. For Division Y. the procurement of Gex at ₹ 46 per unit would be beneficial since it is lower than the external market price. If transfer price set at external market rate ₹ 47 per unit, Division Y would still be able to improve its profit margin as compared to the original transfer price of ₹ 50 per unit.

Given that the marginal cost of manufacturing Gex is only ₹ 30 per unit, the management has to ensure that production of Gex is made in-house. Performance measure at a divisional level should then not be restricted to financial performance alone (full profit responsibility) and should be accordingly modified to include non- financial / operational measures as well.

Question 24:-

GL Ltd. is a multiproduct manufacturing concern functioning with four divisions. The Electrical Division

of the company is producing many electrical products including electrical switches. This division functioning at its maximum capacity sells its switches in the open market at

₹ 25 each. The variable cost per switch to the division is ₹ 16.

The Household Division, another division of GL Ltd., functioning at 70% capacity asked the Electrical Division to supply 5,000 switches per month at the rate of ₹ 18 each to fit in night lamps produced by it. The total cost per night lamp is being estimated as detailed below;

₹	
Components purchased from outside suppliers	50.00
Switch if purchased internally	18.00
Other variable costs	40.00
Fixed overheads	21.00
Total cost per night lamp	129.00

The Household Division is marketing night lamps at a price of ₹ 130 each, with a very small margin, as it is doing business in a very competitive environment. Any increase in price made by the division will push out the division from the market. Therefore, the division cannot pay anything more to switches if they the Electrical Division. Further, the manager of the division informed that it is very much essential to keep on the market share for night lamps by the Household Division to retain the experienced workers of the division. The company is using return on investments (ROI) as a scale to measure the divisional performances and also marginal costing approach for decision making.

Required

(i) Would you RECOMMEND the supply of switches to Household Division by Electrical Division at a price of ₹ 18 each? Substantiate your recommendation with suitable reasons.

(ii) ANALYZE whether it would be beneficial to the company as a whole the supply of switches to Household Division at a unit price of ₹ 18 by Electrical Division.

(iii) Do you feel that- the Divisional Managers should accept the inter-divisional transfers in principle? If yes, what should be the range of transfer price?

(iv) SUGGEST the steps to be taken by the chief executive of the company to change the attitude of divisional heads if they are against the inter-divisional transfers.

Solution:-

(i) Electrical Division is operating at full capacity and selling its switches in the open market at ₹ 25 each. Therefore, it can transfer its production internally by giving up equal number of units saleable in the open market. In this situation, transfer price should be based on variable cost plus opportunity cost { ₹ 16 + (₹ 25 - ₹ 16)} = ₹ 25/-.

As the price quoted by Household Division ₹ 18 is less than the transfer price based on opportunity cost, the Electrical Division should not accept internal transfer. Further, the company is measuring divisional performances based on ROI. Therefore, transferring for a price which is less than the minimum price would affect the return on investments and divisional performance severely.

(ii) In the total cost per night lamp, the Fixed Overheads being a fixed cost is not relevant for decision making. Similarly, the variable cost of switch (₹ 16 p.u.) included in the cost of night lamp is also irrelevant as it is common for both internal and external transfers. The only relevant cost is the loss of

revenue when units are transferred internally.

Accordingly, the benefit from internal transfer would be {₹ 130 - (₹ 50 + ₹ 40) - ₹ 25)

=₹ 15/- on each unit sale on night lamp. Therefore, it is beneficial to the company as a whole to the extent of ₹ 15 per unit of night lamp sold.

Hence, internal transfer is profitable to the company as a whole. Further, Household Division is operating at 70% capacity and has experienced workers which may be utilized for other divisions requirements if any and based on contribution earned fixed cost could be minimized due to large scale of production.

(iii) Internal transfer pricing develops a competitive setting for managers of each division, it is possible that they may operate in the best interest of their individual performance. This can lead to sub-optimal utilization of resources. In such cases, transfer pricing policy may be established to promote goal congruence. The market price of ₹ 25 per switch leaves Electrical Division in an identical position to sale outside. Thus, ₹ 25 is top of the price range. Division Household will not pay to Electrical Division anything above (₹ 130 - ₹ 50 - ₹ 40) = ₹ 40/-. The net benefit from each unit of night lamp sold internally is

₹ 15. Thus, any transfer price within the range of ₹ 25 to ₹ 40 per unit will benefit both divisions. Divisional Managers should accept the inter divisional transfers in principle when the transfer price is within the above range.

(iv) Transfer at marginal cost are unsuitable for performance evaluation since they do not provide an incentive for the supplying division to transfer goods and services internally. This is because they do not contain a profit margin for the supplying division. Chief Executive's intervention may be necessary to instruct the supplying division to meet the receiving division's demand at the marginal cost of the transfers. Thus, divisional autonomy will be undermined. Transferring at cost plus a mark-up creates the opposite conflict. Here the transfer price meets the performance evaluation requirement but will not induce managers to make optimal decisions.

To resolve the above conflicts the following transfer pricing methods have been suggested:

Dual Rate Transfer Pricing System

The supplying division records transfer price by including a normal profit margin thereby showing reasonable revenue. The purchasing division records transfer price at marginal cost thereby recording purchases at minimum cost. This allows for better evaluation of each division's performance. It also improves co-operation between divisions, promoting goal congruence and reduction of sub-optimization of resources.

Two Part Transfer Pricing System

This pricing system is again aimed at resolving problems related to distortions caused by the full cost based transfer price. Here, transfer price = marginal cost of production + a lump-sum charge (two part to pricing).

While marginal cost ensures recovery of additional cost of production related to the goods transferred, lump-sum charge enables the recovery of some portion of the fixed cost of the supplying division. Therefore, while the supplying division can show better profitability, the purchasing division can purchase the goods at lower rate compared to the market price.

Question 25:–

Great Vision manufactures a wide range of optical products including lenses and surveillance cameras. Division 'A' manufactures the lenses while Division 'B' manufactures surveillance cameras. The lenses that Division 'A' manufactures is of standard quality that has a number of applications. Due to huge demand in the market for its products Division 'A' is operating at full capacity. It sells its lenses in the open market for ₹ 140 per lens, the variable cost of production for each lens is ₹ 110, while the total cost of production is ₹ 125 per lens.

The total production cost of a camera by Division 'B' is ₹ 400 each. Currently Division 'B' procures lens from foreign vendors, the cost per lens would be ₹ 170 each. The management of Great vision has proposed that to take advantage of in-house production capabilities and consequently the procurement cost of the lens would reduce. It is proposed that Division 'B' should buy an average of 5,000 lenses each month from Division 'A' at ₹ 120 per lens. The estimate cost of a surveillance camera is as below:

Other components purchased from external vendors	150
Cost of lens purchased from Division 'A'	120
Other variable costs	30
Fixed overheads	50
Total cost of a camera	350

Each surveillance camera is sold for ₹ 410. The margin for each camera is low since competition in the market is high. Any increase in the price of a camera would reduce the market share. Therefore, Division 'B' cannot pay Division 'A' beyond ₹ 120 per lens procured.

Great vision's management uses Return on investments (ROI) as a scale to measure the divisional performance and marginal costing approach for decision making.

Required

(i) ANALYZE the behavioral consequences of each division when Division 'A' supplies lenses to Division 'B' at ₹ 120 per lens? Substantiate your answer based on the information given in the problem.

(ii) ANALYZE if it would be beneficial to the company as a whole for Division 'A' to supply the lenses to Division 'B' at ₹ 120 per lens.

(iii) Do you feel that the divisional managers should accept the inter-divisional transfers in principle? If yes, CALCULATE the range of transfer price?

(iv) ADVISE alternate transfer pricing models that the chief executive of the company can consider in order to change the attitude of the divisional heads if they are against the transfer pricing policy.

(v) CALCULATE the range of transfer price, if Division 'A' has excess capacity and can accommodate the internal requirement of 5,000 lens per month within the current operations.

Solution:-

(i) Analysis of Behavioral Consequences

Division 'A' has huge demand for its lenses enabling it to operate at full capacity. External sales yield a contribution of ₹ 30 per lens sold (selling price of ₹ 140 less variable cost of ₹ 110 per lens). Likewise, each sale yields a profit ₹ 15 per lens (selling price of ₹ 140 less cost of production ₹ 125 per lens). This yields an ROI of 12% (profit of ₹ 15 per lens over a cost investment of ₹ 125 per lens).

If Division 'A' sells lens to Division 'B' at ₹ 120 per lens, it contribution reduces to ₹ 10 per lens

(transfer price ₹ 120 less variable cost ₹ 110) while overall it shows a loss of ₹ 5 per lens (transfer price ₹ 120 less total cost of production is ₹ 125 per lens). The loss of ₹ 5 per lens is on account of (i) only partial recovery of fixed cost of production and (ii) opportunity cost in the form of loss of profit from external sales. This would therefore result in lower divisional profit for Division 'A'.

Consequently, the manager of Division 'A' would not accept the transfer price of ₹ 120 per lens. Lower profitability due to internal sales may demotivate the division. Due to the benefits of internal procurement, the management of Great vision may want to increase the capacity of Division 'A' or infuse more investment to expand its operations.

However, due to inability to recover fixed costs in its entirety from internal sales the ROI of the division is impacted, therefore divisional performance would be perceived to be lower. Therefore, it may oppose decisions as this would lead to higher fixed costs. At an overall level, such opposition may be detrimental to the company, leading to sub optimization of resources.

The current total cost of production for Division 'B' is ₹ 400 per camera. Each sale yields a profit of ₹ 10 per camera (Selling price ₹ 410 less total cost of production ₹ 400 per camera). Therefore, the current ROI is 2.50% (profit of ₹ 10 over cost investment of ₹ 400 per camera). If the lens is procured from Division 'A' at ₹ 120 per lens, Division 'B' can get a benefit of ₹ 50 per camera due to lower procurement cost. If lenses are procured from Division 'A', referring to the cost estimate given in the problem, Division 'B' can earn a contribution of ₹ 110 per lens sold (sale price of ₹ 410 per camera less variable cost of ₹ 300 per camera) and a profit of ₹ 60 per camera (sale price of ₹ 410 per camera less total cost of production of ₹ 350 per camera). Therefore, ROI improves to 17.14% (profit of ₹ 60 over cost investment of ₹ 350 per camera). By procuring the lenses internally, the profit of the division improves substantially. Consequently, the manager of Division 'B' would accept the transfer price of ₹ 120 per camera.

(ii) Analysis of Overall Benefit to the Company (from internal transfer)

While calculating the benefit to the company, the fixed cost of each division is ignored. It is also given in the problem, that only marginal cost (variable cost) is considered for decision making.

As explained above, each external sale yields a contribution of ₹ 30 to Division 'A'. The lost contribution each month from diversion of external sales of Division 'A' towards internal transfer to Division 'B' = 5,000 units × ₹ 30 per lens = ₹ 1,50,000 per month. This is an opportunity cost to the company.

The current procurement price for Division 'B' is ₹ 170 per lens. The same lens can be manufactured at ₹ 110 (variable cost) by Division 'A'. Therefore, cost of production reduces by ₹ 60 for the company. Savings in procurement cost = 5,000 units × ₹ 60 per lens = ₹ 3,00,000 per month. This is a savings to the company.

Therefore, the net benefit to the company at an overall level = ₹ 1,50,000 per month. Please note that the internal transfer price affects profitability of individual division but does not affect the company's overall profitability.

(iii) Range of Transfer Price

As explained above, the company gets a net benefit of ₹ 1,50,000 per month by procuring the lenses internally. Therefore, the divisional managers should accept the transfer pricing model. At the same time, neither division should be at a loss due to this arrangement. When the transfer price is ₹ 120 per lens, Division 'A' bears the loss, which will impact assessment of the division's performance. Therefore, an acceptable range for transfer price should be worked out. This can be done as below:

When the supplying division operates at full capacity, the range for transfer pricing would be-

Minimum transfer price = marginal cost p.u. + opportunity cost p.u.

Since the supplying division is operating at full capacity, it has no incentive to sell the goods to the purchasing division at a price lower than the market price. If the internal order is accepted, capacity is diverted towards this sale. Hence the supplying division would additionally charge the lost contribution from external sales that had to be curtailed. By doing so, the division will be indifferent whether the sale is an external or internal one.

Therefore, the minimum transfer price (which would be set by Division 'A', the supplier)

= marginal cost per lens + opportunity cost per lens = ₹ 110 + ₹ 30 per lens = ₹ 140 per lens. In other words, the minimum transfer price would be the external sale price of each lens.

Maximum transfer price = Lower of net marginal revenue and the external buy-in price. The maximum transfer price (which would be determined by Division 'B', the procurer) = lower of net marginal revenue and the external buy-in price.

Net marginal revenue would be the revenue per one additional sale. Net marginal revenue per camera = marginal revenue – marginal cost (i.e. variable cost excluding the cost of the lens) to Division 'B' = ₹ 410 - ₹ (150+30) = ₹ 410 - ₹ 180 = ₹ 230 per camera. This is the maximum price that Division 'B' can pay for the lens, without incurring any loss. As mentioned before, fixed cost is ignored for this analysis.

The current external procurement price is ₹ 170 per lens.

Therefore, the maximum price that Division 'B' would be willing to pay = lower of net marginal revenue (₹ 230 per camera) or external procurement cost (₹ 170 per lens). Therefore, Division 'B' would pay a maximum price, equivalent to the current external price of ₹ 170 per lens. It will not pay Division 'A', price more than the external market price for a lens.

Therefore, the acceptable range for transfer price would range from a minimum of ₹ 140 per lens and maximum of ₹ 170 per lens. The managers may be given autonomy to negotiate a mutually acceptable transfer price between this range.

(iv) Advise on Alternative to Current Transfer Pricing System

Other alternative transfer pricing models that can be considered are:

Dual Pricing

The supplying division, Division 'A', records transfer price by including a normal profit margin thereby showing reasonable revenue. At the current market price per lens, transfer price for Division A would be ₹ 140 per lens. The purchasing division, Division 'B', records transfer price at marginal cost thereby recording purchases at minimum cost. As per the current production cost, the transfer price for Division 'B' would the variable cost incurred by Division 'A' to manufacture one lens, that is ₹ 110 per lens.

This allows for better evaluation of each division's performance. It also improves co- operation between divisions, promoting goal congruence and reduction of sub- optimization of resources.

Drawbacks of dual pricing include:

   a) It can complicate the records, thereby may result in errors in the company's overall records.

   b) Profits shown by the divisions are artificial and need to be used only for internal evaluations.

Two Part Pricing System

Here, transfer price = marginal cost of production + a lump-sum charge (two part to pricing). While marginal cost ensures recovery of additional cost of production related to the goods transferred, lump-sum charge enables the recovery of some portion of the fixed cost of the supplying division. Therefore,

while the supplying division can show better profitability, the purchasing division can purchase the goods a lower rate compared to the market price.

The proposed transfer price of ₹ 120, is a two-part price that enables Division 'A' to recover the marginal cost of production of a lens as well as portion of the fixed cost. However, as explained in part (i) above, this price is insufficient to provide a reasonable return to Division 'A'. Therefore, the management of Great vision along with the divisional managers have to negotiate a price that is reasonable to Division 'A' while not exceeding the current procurement price of ₹ 170 per lens for Division 'B'. As explained in part (iii) of the solution, in the given case, the range of ₹ 140 to ₹ 170 per lens, would help resolve this conflict.

Range of Transfer Price where Division 'A' has excess capacity

When the supplying division has excess capacity, the range for transfer pricing would be

(a) Minimum transfer price (determined by Division 'A') = marginal cost per lens =

₹ 110 per lens. This ensures that the Division 'A' is able to recoup at least its additional outlay of ₹ 110 per lens incurred on account of the transfer. Fixed cost is a sunk cost hence ignored. Since capacity can be utilized further, it would be optimum for Division 'A' to charge only the marginal cost for internal transfer. Division 'B' gets the advantage getting the goods at a lower cost than market price.

(b) Maximum transfer price (determined by Division 'B') = Lower of net marginal revenue and the external buy-in price. As explained in part (iii) above, this would be lower of net marginal revenue of ₹ 230 per camera or external buy-in price of ₹ 170 per lens, Therefore, the maximum transfer price would be ₹ 170, the external market price beyond which Division 'B' will be unwilling a higher price to Division 'A'.

Hence, when Division 'A' has excess capacity, the minimum transfer price would be ₹ 110 per lens while the maximum transfer price would be ₹ 170 per lens.

Question 26:–

Jigyasa India Ltd. (JIL) has 30 retail stores of uniform sizes 'Fruity & Sweety Retails' across the country. Mainly three products namely 'Butter Jelly', 'Fruits & Nuts' and 'Icy Cool' are sold through these retail stores. JIL maintains stocks for all retail stores in a centralised warehouse. Goods are released from the warehouse to the retail stores as per requisition raised by the stores. Goods are transported to the stores through two types of vans i.e. normal and refrigerated. These vans are to be hired by the JIL.

Costs per month of JIL are as follows:

(₹)		Total (₹)
Warehouse Costs:		
Labour & Staff Costs	27,000	
Refrigeration Costs	1,52,000	
Material Handling Costs	28,000	2,07,000
Head Office Cost:		
Salary & Wages to Head Office Staff	50,000	
Office Administration Costs	1,27,000	1,77,000
Retail Stores Costs:		

Labour Related Costs	33,000	
Refrigeration Costs	1,09,000	
Other Costs	47,000	1,89,000

Average transportation cost of JIL per trip to any retail stores are as follows:

Normal Van	₹ 3,200
Refrigerated Van	₹ 4,900

The Chief Financial Manager asked his Finance managers to calculate profitability based on three products sold through Fruity & Sweety retail stores rather than traditional method of calculating profitability.

The following information regarding retail stores are gathered:

	Butter Jelly	Fruits & Nuts	Icy Cool
No. of Cartons per cubic metre (m3)	42	28	40
No. of Items per cartons (units)	300	144	72
Time in Warehouse (in months)	1	1.5	0.5
Time in Retail Stores (in months)	1	2	1
Selling Price per unit (₹)	84	42	26
Purchase Price per unit (₹)	76	34	22

Butter Jelly and Icy-Cool are required to be kept under refrigerated conditions. Additional information:

Total Volume of All Goods Sold per month	40,000 m3
Total Volume of Refrigerated Goods Sold per month	25,000 m3
Carrying Volume of each van	64 m3

Required

CALCULATE the Profit per unit using Direct Product Profitability (DPP) method.

Solution

Direct Product Profitability (DPP) Statement

(Amount in ₹)

	Butter Jelly	Fruits & Nuts	Icy Cool
Selling Price per unit	84.00	42.00	26.00
Less: Purchase Price per unit	76.00	34.00	22.00
Gross Profit...(A)	8.00	8.00	4.00
Direct Product Costs:			
Warehouse Costs per m3 [W.N.-1]	7.46	2.07	3.73
Retail Stores Costs per m3 [W.N.-2]	6.36	4.00	6.36
Transportation Costs [W.N.-3]	76.56	50.00	76.56

Total DPP costs per m3	90.38	56.07	86.65
Items per m3 [W.N.-4]	12,600	4,032	2,880
Cost per item …(B)	0.007	0.014	0.030
Direct Product Profit…(A) – (B)	7.993	7.986	3.97

Working Notes

Warehouse Related Costs

	General Costs (₹)	Cost Related with Refrigerated Goods (₹)
Labour & Staff Costs	27,000	---
Refrigeration Costs	---	1,52,000
Material Handling Costs	28,000	---
Total	55,000	1,52,000
Volume of Goods Sold	40,000 m3	25,000 m3
Cost per m3 per month	1.38	6.08

Products	Time in Warehouse	Cost per m3 per month (₹)	Total Cost (₹)
Butter Jelly	1 Month	7.46 (1.38 + 6.08)	7.46
Fruits & Nuts	1.5 Months	1.38	2.07
Icy-cool	0.5 Months	7.46 (1.38 + 6.08)	3.73

Retail Stores Related Costs

	General Costs (₹)	Cost Related with Refrigerated Goods (₹)
Labour Related Costs	33,000	---
Refrigeration Costs	---	1,09,000
Other Costs	47,000	---
Total	80,000	1,09,000
Volume of Goods Sold	40,000 m3	25,000 m3
Cost per m3 per month	2.00	4.36
Products	Time in Retail Stores	Cost per m3 per month	Total Cost

Butter Jelly	1 Month	₹ 6.36 (₹ 2.00 + ₹ 4.36)	₹ 6.36
Fruits & Nuts	2 Months	₹ 2.00	₹ 4.00
Icy-Cool	1 Month	₹ 6.36 (₹ 2.00 + ₹ 4.36)	₹ 6.36

Transportation Costs

	Normal Van Costs	Refrigerated Van Costs
Cost per trip	₹ 3,200	₹ 4,900
Volume of Van	64 m3	64 m3
Cost per m3 per trip	₹ 50.00	₹ 76.56

No. of Items per m3

Products	No. of Cartons/ m3	No. of Items per Cartons (units)	No. of Items per m3
Butter Jelly	42	300	12,600 (42 × 300)
Fruits & Nuts	28	144	4,032 (28 × 144)
Icy - Cool	40	72	2,880 (40 × 72)

Question 27:–

Queenstown Furniture (QF) manufactures high-quality wooden doors within the forests of Queenstown since 1952. Management is having emphasize on creativity, engineering, innovation and experience to provide customers with the door they desire, whether it is a standard design or a one-of-a-kind custom door. The following information pertains to operations during April:

Processing time	9.0 hrs.*	Waiting time	6.0 hrs.*
Inspection time	1.5 hr.*	Move time	7.5 hrs.*
Units per batch	60 units		

(*) average time per batch

Required

COMPUTE the following operational measures:

(i) Average non-value-added time per batch

(ii) Average value added time per batch
(iii) Manufacturing cycle efficiency
(iv) Manufacturing cycle time

Solution

Average Non Value Added Time per batch =　　Inspection Time + Waiting Time + Move Time

=　　1.5 hr. + 6.0 hrs. + 7.5 hrs. = 15 hrs.

Average Value Added Time per batch　　=　　Processing Time = 9 hrs.

Manufacturing Cycle Efficiency　　=

$$\text{Processing Time}$$

Processing Time + Inspection Time + Waiting Time + Move Time

$$= \frac{9.0 \ hrs.}{9.0 \ hrs + 1.5 \ hrs + 6.0 \ hrs + 7.5 \ hrs} = 37.5 \text{ hrs.}$$

Manufacturing Cycle Time $= \frac{Total \ Productive \ time}{Units \ per \ batch}$

$$= \frac{24 \ hrs.}{60 \ units} = 0.40 \text{ hrs. per unit}$$

Question 28:–

"W" specialises in engineering design and manufacture in the automotive and motorsport industry. "W"'s design team has many years' experience in the design and development of engine components for the market and high performance engines. Though "W" is performing well, but many a times, the customers complained that they had to wait for long after placing the orders. "W" is interested in cutting the amount of time between when a customer places an order and when the order is completed. For the last year, the following data were reported in respect of Division "D":

Inspection time = 0.5 days per batch Process time = 2.8 days per batch

Wait time	=	16.0 days per batch
Queue time	=	4.0 days per batch
Move time	=	0.7 days per batch
Required		

CALCULATE Manufacturing Cycle Efficiency (MCE) and INTERPRET the result.

(i) STATE what percentage of the production time is spent in non-value added activities.
(ii) CALCULATE the delivery cycle time.
(iii) CALCULATE the new MCE if by using Lean Production all queue time can be eliminated.

Solution:-

Manufacturing Cycle Efficiency (MCE)

$$\frac{Processing\ Time}{Inspection\ TIme + Process\ time + Queue\ time + Move\ time + Wait\ time}$$

$$= \frac{2.8\ days}{0.5\ days + 2.8\ days + 4.0\ days + 0.7\ days + 16.0\ days} = 11.67\%$$

Interpretation

In AKG, the MCE is 11.67%, which means that 88.33% of the time a unit is in process is spent on the activities that do not add value to the product. Monitoring the MCE helps companies to reduce non - value added activities and thus get products into the hands of customers more quickly and at a lower cost.

(ii) Percentage of Time Spent on Non- Value Added Activities
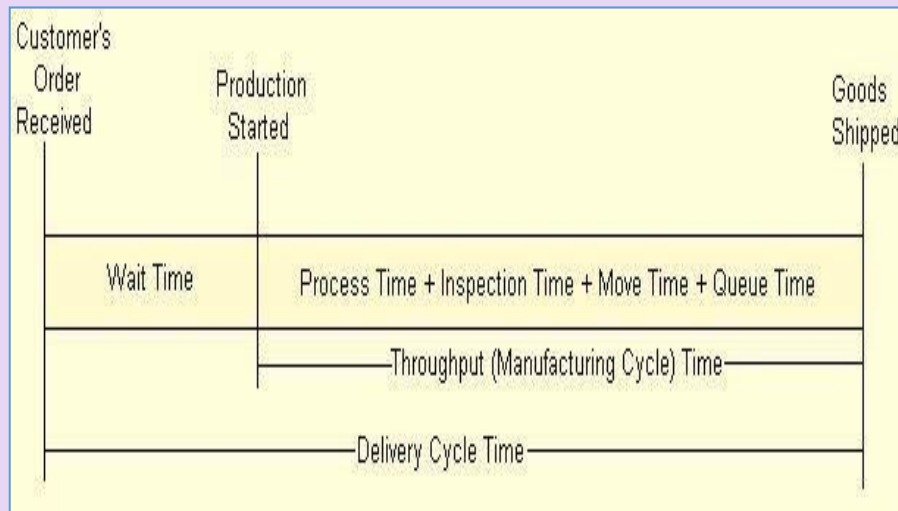
= 100% -11.67%

= 88.33%

(iii) Delivery Cycle Time

= 0.5 days + 2.8 days + 4.0 days + 0.7 days + 16 days

= 24 days

(iv) Revised MCE

$$\frac{2.8\ days}{0.5\ days + 2.8\ days + 4.0\ days + 0.7\ days + 16.0\ days} = 14\%$$

Strategic Cost and Performance Management

Alternative

(i) Manufacturing Cycle Efficiency (MCE) Value Added Time (ProcessingTime)

= _____

Throughput (ManufacturingCycle)Time

= 2.8 days
_____
0.5 days + 2.8 days + 4.0 days + 0.7 days

= 35%

Interpretation

In AKG, the MCE is 35%, which means that 65% of the time a unit is in process is spent on the activities that do not add value to the product. Monitoring the MCE helps companies to reduce non -value added activities and thus get products into the hands of customers more quickly and at a lower cost.

(i)   Percentage of Time Spent on Non- Value Added Activities

= 100% -35%

= 65%

(ii)   Delivery Cycle Time

= 0.5 days + 2.8 days + 4.0 days + 0.7 days + 16 days

= 24 days

(iii)   Revised MCE

= $\dfrac{2.8 \text{ days}}{0.5 \text{ days} + 2.8 \text{ days} + 0 \text{ days} + 0.7 \text{ days}}$

= 70%

Question 29:–

ABC Airlines has two divisions organised as profit centres, the Passenger Division and t he Cargo Division. The following divisional informations were given for the year ended 31 st March 2021:

Particulars	Cargo Division	Passenger Division	Total
Number of personnel trained	200	800	1,000
Number of flights	350	250	600
Number of reservations requested	Nil	7,000	7,000
Revenue	₹ 42,00,000	₹ 42,00,000	₹ 84,00,000
Operating Expenses (excluding service department charges)	₹ 36,00,000	₹ 28,50,000	₹ 64,50,000
Service Department Charges			
Training	₹ 3,20,000	₹ 3,20,000	₹ 6,40,000
Flight Scheduling	₹ 1,50,000	₹ 1,50,000	₹ 3,00,000
Reservations	₹ 1,05,000	₹ 1,05,000	₹ 2,10,000

The service department charge rate for the service department costs was based on revenue. Since the revenue of both the divisions were the same, the service department charges to each division were also the same.

Required

(i) COMMENT on whether the income from operations for the two divisions accurately measures performance.

(ii) PREPARE the divisional income statement using the activity bases provided above in revising the service department charges.

Solution:-

i) The reported income from operations does not accurately measure performance because the service department charges are based on revenue. Revenue is not associated with the profit centre manager's use of the service department services. For example, the Reservations Department serves only the Passenger Division and number of reservation requested by Cargo Division is NIL. Thus, by charging this cost based on revenue, these costs are incorrectly charged to the Cargo Division. Further, the Passenger Division requires additional personnel. Since these personnel must be trained, the training costs assigned to the Passenger Division should be greater than the Cargo Division.

ABC Airlines

Divisional Income Statement

For the Year Ended March 31, 2010

Particulars	Cargo Division (₹)	Passenger Division (₹)	Total (₹)
Revenue	42,00,000	42,00,000	84,00,000
Less: Operating Expenses (excluding service department charges)	36,00,000	28,50,000	64,50,000
Gross Margin	6,00,000	13,50,000	19,50,000
Less: Service Department Charges			
Training	1,28,000 ₹ 6,40,000 / 200	5,12,000 ₹ 6,40,000 / 800	6,40,000

	1,000	1,000	
Flight Scheduling	1,75,000	1,25,000	3,00,000
	350	250	
	₹ 3,00,000	₹ 3,00,000	
	600	600	
Reservation	NIL	2,10,000	2,10,000
		7,000	
		₹ 2,10,000	
		7,000	
Operating Income	2,97,000	5,03,000	8,00,000

Question 30:–

Jawahar Stationary Mart (JSM) is located in centre of city "X" and popular for wide range of stationary products at competitive rate. Box files and cobra files are among the major product of JSM. JSM clients majorly, include medium and large corporate offices apart from reasonable base of retail clients. Mr. Ronit who done his masters in operations and marketing, recently join the family business (JSM). Mr. Ronit during first week itself, identify there are regular complaints from corporate clients regarding 'delivery of items, which are different from what is ordered' and 'for not meeting the requirements'. Mr. Ronit understands consumer behavior is very critical in nature, if understood well and used through-out the business operation; then can be key success factors. Hence with intent to establishing the integrated relations with customers at JSM, Mr. Ronit advise marketing team to start recording the date regarding customer in systemic manner and reporting of same.

Following is information regarding five major customers, who are regularly orders printed cobra files (Product code – J-Cobra 10) from JSM.

Particulars	A	B	C	D	E
No. of units sold	6,000	8,000	10,000	7,000	8,000
Margin per unit (₹)	6	7.5	7	8	10
No. of purchase order	10	30	25	20	10
No. of deliveries (normal)	3	4	6	4	5
Kilometers per delivery	100	185	50	250	50

Cost of processing the order is ₹ 2,000 per order and cost of handling material is ₹ 0.15 per item, whereas transport cost is ₹ 3 per kilometer for delivery of goods. 3 rushed deliveries made to 'B', cost for rush delivery is ₹ 800 per delivery.

Required

(i) ANALYZE customer profitability for JSM.

(ii) EXPLAIN three fundamental aspects of CRM to facilitate building relationship with profitable customer/(s).

Solution:-

Statement of the Customer Profitability at JSM

Particulars	A (₹)	B (₹)	C (₹)	D (₹)	E (₹)
Margin ...(A) (no. of units sold × margin per unit)	36,000	60,000	70,000	56,000	80,000
Customer Attributable Costs:					
Cost of Processing Purchase Orders (no. of purchase order × cost of processing the order)	20,000	60,000	50,000	40,000	20,000
Product Handling Cost (no. of units sold × cost of handling per item)	900	1,200	1,500	1,050	1,200

|					
Delivery Cost (no. of deliveries × km per delivery × cost per km)	900	2,220	900	3,000	750
Cost of Rush Deliveries (no. of rush deliveries × cost per rush delivery)	---	2,400	---	---	---
Total ...(B)	21,800	65,820	52,400	44,050	21,950
Profit (or Loss)...(A) – (B)	14,200	-5,820	17,600	11,950	58,050
Profit/ Net Revenue (in % age)	39.44 %	-9.7%	25.14 %	21.34 %	72.56 %

Analysis

From above, it can be concluded that customer A, C, and D are less profitable than customer E; whereas customer B is causing losses. Customer B provides a positive operating margin but is unprofitable when customer attributable costs are considered. This is because customer B requires more sales orders than the other customers. In addition, the customer has rush delivery costs.

This analysis can make sense, if interpreted, considering the 'Pareto Analysis'. Pareto Analysis named after economist Vilfredo Pareto, who specifies that 80% of consequences come from 20% of the causes i.e. 20% of customer provide 80% of the profit. Means input and output may not be balanced. (Curve of revenue, as shown in figure; represent that initially large amount of revenue comes from small portion of sales/customers only - such small proportion of customers is critical to success of entity).

Although here proportion of 80:20 don't hold truth, but for JSM; major portion of profit (around 60%) coming from customer E only, therefore, customer E is critical to JSM. Special attention can then be given to enhancing the relationships with the customer E to ensure that customer E cannot migrate to other competitors. In addition, greater emphasis can be given to attract new customers that have the same attributes as the most profitable customer E.
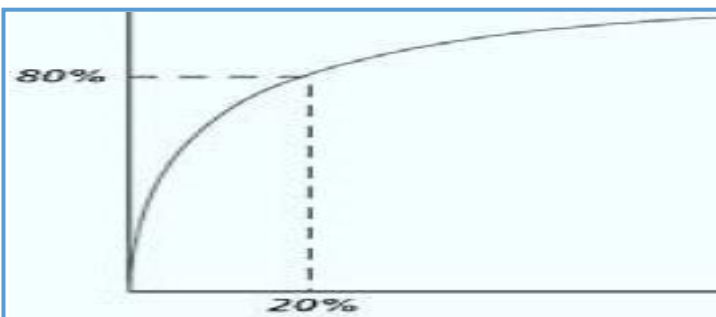
Further, there is no point in serving customer B, but instead of refusing to trade with customer B, if possible; it may be better to turn it into profitable customer. Customer B can be made profitable if action is taken to convince the customer B to place a smaller number of larger quantity orders and

avoid rush deliveries. If customer B cannot be convinced to change its buying behavior, selling prices should be increased to cover the extra resources consumed.

(ii) Supply chain management is the technique to integrate the supplier, manufacturing, store, and distribution function efficiently; in order to procure, produce and distribute at/in right time, quantity and place respectively. For effective distribution, CRM can be enabling tool. CRM is an integrated approach to manage and coordinate customer interactions to identifying, acquiring, and retaining customers. CRM enables businesses to understand and retain customers (through better customer experience) apart from attracting new customer, in order to increase profitably and decrease customer management costs. CRM system, comprises following three fundamental aspects to facilitate building relationship with profitable customers –

- Operative CRM takes care of individual transactions and is used by operational team. Interactions by customers are kept in the data base and are used later by the service, sales, and marketing team for operational decisions. In JSM, the staff who is responsible to deal with customer must be given access to customer's details including all the information of activities performed earlier. This will enhance the JSMs' staff's efficiency to deal with customer-facing processes in a better way.

- Analytical CRM analyses the data created on the operational side of the CRM effort for evaluation and prediction of customer behavior. In JSM, analytical CRM can highlight the patterns in customers' behavior which will help sale team while pitching the product at JSM.

- Collaborative CRM ensures that information about customer must flow seamlessly throughout the supply chain, majorly distribution channel; in form of collaborative effort by all associated department of JSM to increase the quality of services provided to customers. Increase in utility at customer end will result in increased loyalty. Collaborative CRM comprises interactive technology like email, digital media to simplify the communications between customers and staff which would help in building relationships.

Question 31:–

Bookmark LLP is a publishing firm that started operations very recently. The firm has published "Advanced Learner's Dictionary" this first year, that have been sold to 3 distributors PER, MGH and WLY. The firm's financials reflect profits in its first year of operations. The management is pleased with the results. However, they are interested in finding out how profitable each customer is. This would help them formulate their sales strategy.

Particulars	PER	MGH	WLY
Sales units p.a.	1,000	950	1,250
Sale price (gross)	250	250	250
Payment terms	3/10 net 30	net 30	3/10 net 30
Sales returns	0.5%	0%	10%

Delivery terms	FOB destination	FOB destination	FOB shipping point

In order to get market share, PER and WLY have been extended credit terms to avail discount if payment is made within 10 days. Customer MGH does not have much bargaining power and hence has been allowed only 30 days' credit period without any benefit of availing discount for early payment. Both PER and WLY have made payments within 10 days to avail of the discount extended.

On the cost front, variable cost of goods sold attributable to the net sales to customers PER, MGH and WLY are ₹ 1,50,000, ₹ 1,42,500, and ₹ 1,87,500 respectively. Key metrics of customer assignable marketing, administrative and distribution costs are as below:

Activity	Activity Driver	No. of Units of Activity Driver			Cost Driver Rate (₹)
		PER	MGH	WLY	
Order taking and processing	# of orders	4	2	15	300
Expedited / rush orders	# of orders	1	-	5	250
Delivery costs	# distance in km.	100	50	-	80
Sale return processing	# of returns	1	-	8	150
Billing cost	# of invoices	4	2	15	50
Customer visit	# of visits	1	-	5	800
Inventory carrying cost *	# 1 per unit	1,000	950	1,250	10

* Assume no opening and closing stock

Fixed cost that are not assignable to any customer is ₹ 1,00,000 p.a.

Required

1. PREPARE the customer wise profitability statement as also the overall profitability statement of Bookmark LLP.
2. RECOMMEND a strategy for Bookmark LLP regarding its customers.

Solution:-

Customer Wise Profitability Statement and Overall Profitability Statement

SN.	Particulars	PER	MGH	WLY	Total

					₹
A	Sales (net proceeds) – Table 1	2,41,288	2,37,500	2,72,812	7,51,600
B	Variable Cost of Goods Sold	1,50,000	1,42,500	1,87,500	4,80,000
C	Assignable- Marketing and Administration Cost - Table 2				
	Order Taking and Processing	1,200	600	4,500	6,300
	Sale Return Processing	150	-	1,200	1,350
	Billing Cost	200	100	750	1,050
	Customer Visit	800	-	4,000	4,800
	Total Assignable Marketing and Administration Cost	2,350	700	10,450	13,500
D	Assignable- Distribution Cost - Table 2				
	Expedited / Rush Orders	250	-	1,250	1,500
	Delivery Costs	8,000	4,000	-	12,000
	Inventory Carrying Cost	10,000	9,500	12,500	32,000
	Total Assignable Distribution Cost	18,250	13,500	13,750	45,500
E	Non- Assignable Fixed Cost	-	-	-	1,00,000
F	Total Costs (B+C+D+E)	1,70,600	1,56,700	2,11,700	6,39,000
G	Net Profit (Step A - F)	70,688	80,800	61,112	1,12,600

| H | Profit % of Sales (G / A) | 29% | 34% | 22% | 15% |

Workings

Table 1: Customer Sales Analysis - Revenue Analysis

All figures in ₹

Particulars	PER	MGH	WLY	Total ₹
Sales {Sale Units × Sale Price (gross)}	2,50,000	2,37,500	3,12,500	8,00,000
Less: Sale Return (Step 1 × Return%)	1,250	-	31,250	32,500
Net Sales	2,48,750	2,37,500	2,81,250	7,67,500
Less: Cash Discount	7,462	-	8,438	15,900
Net Proceeds	2,41,288	2,37,500	2,72,812	7,51,600
Final Collections vs Original Sale	97%	100%	87%	94%

Table 2: Assignable Marketing, Administrative and Distribution Costs

All figures in ₹

Particulars	PER	MGH	WLY	Total
Order Taking and Processing (# of orders × cost per order)	1,200	600	4,500	6,300
Expedited / Rush Orders (# of orders × cost per order)	250	-	1,250	1,500
Delivery Costs (Distance in km. × cost per km)	8,000	4,000	-	12,000
Sale Return Processing (# of returns × cost per return)	150	-	1,200	1,350

Billing Cost (# of invoices × cost per invoice)	200	100	750	1,050
Customer Visit (#of customer visits × cost per visit)	800	-	4,000	4,800
Inventory Carrying Cost (# of units × inventory carrying cost p.u.)	10,000	9,500	12,500	32,000

(ii) Customer strategy: It can be seen that Bookmark LLP has an overall profit of ₹ 1,12,600 or 15% of sales. While the performance is good, the firm's management has to analyze customer wise profitability.

(a) WLY is the largest customer in terms of units sold. However, Table 1 above shows that sale returns at 10%, which is unusually large compared to other customers. Bookmark LLP has to investigate why the returns are of such large quantity. Possibly, there could be communication gap between the firm and WLY. Possible non-conformity in goods delivered has resulted in returns. Only 87% of the original sale value is being collected. The root cause of the problem has to be identified and rectified. This will also reduce the sale return processing costs.

(b) WLY has placed many rush orders, which requires Bookmark LLP to ship these orders immediately, using costlier means of transportation. Currently, there is no charge for shipping rush orders. In order to deter WLY from repeatedly placing rush orders, Bookmark LLP can charge the customer for shipping such orders beyond a threshold number of orders. Say rush orders beyond 2 orders will be charged to the customer.

(c) WLY has placed 15 orders for 1,250 units. Comparatively, PER and MGH placed 4 and 2 orders for approximately 1,000 units each. WLY can be requested to place fewer orders with larger quantity per order, in order to optimize ordering cost.

(d) Being the largest customer, WLY has 5 sale visits from Bookmark LLP, which is more than the other 2 customers. Priced at ₹ 800 per visit, this very costly. At the same time, WLY is yielding the least profit. Therefore, Bookmark LLP should reassess if resources can be reallocated to the other two more profitable customers. That may encourage more sales from higher yielding customers.

(e) Since WLY seems to need more hand-holding in terms of more sales visits as well as higher rush orders, Bookmark LLP may assess if it wants to discontinue or reduce business. Alternatively, it may reassign these resources towards existing or newer customers to get better profitability. However, if WLY can be migrated to a higher profitability, Bookmark LLP need not lose out i ts market share.

(f) Customer MGH is the most profitable yielding 34% return over sales, although in terms of 'Advanced Learner's Dictionary' ordered, it is the smallest of the three. Bookmark LLP can assess if it can extend some discount, in order to encourage more sales. Currently, Customer MGH does not get any discount.

(g) Bookmark LLP can assign more sales visits to Customer PER and MGH to encourage them purchase more as well as provide high quality customer service.

Question 32:–

Melody is a manufacturer of musical instruments. The company specializes in manufacture of Piano and Electronic Keyboard instruments. They are both labour-intensive products. Therefore, Melody follows absorbed its production overheads based on direct labour hours.

Piano– Melody's Pianos are of very high quality. Client patronage include professional Piano musicians. Some of these instruments are sold in its standard form. However, musicians particularly the concert players require their pianos to be customized to certain specifications. Customization primarily relates to the acoustic quality of the piano sound. Quality of sound is of paramount importance to musicians as it determines the power and warmth of tone. Each musician has a preference to achieve a special quality of sound. Therefore, no two customized Pianos can be the same. Due to its reputation, Melody receives numerous requests for customization from its customers. Ability to provide customization service sets Melody apart from its competitors.

Customization requires the services of professional craftsmen. They are hired as subcontractors for such work based on the need. These craftsmen perform their services within the factory premises. For this a special work, space is maintained by Melody. Melody charges its customers extra for sub-contracting cost plus 10%. This would cover the actual cost of subcontracting and any incidental overheads incurred. The Board of Melody accepts that this method of billing is very simplistic. It is unsure if the company is recovering the entire cost of providing this customization service.

Electronic Keyboard Instruments– These are instruments manufactured by Melody are home Keyboards that are targeted at young music enthusiasts who are beginning to learn music. They come in standard sizes, comprised of standard components. No customizations are done to Keyboards.

As a performance management expert, the Board wants your advice. The extract below provides the most recent management accounts for the Piano and Keyboard Division.

Figures in ₹

Sr. No.	Particulars	Piano	Keyboard	Total
1.	Number of items manufactured	1,000	10,000	
2.	Sale Price per unit	2,50,000	15,000	
3.	Revenue	25,00,00,000	15,00,00,000	40,00,00,000
4.	Materials	7,50,00,000	3,75,00,000	11,25,00,000
5.	Direct Labour	8,00,00,000	6,75,00,000	14,75,00,000
6.	Subcontracting Cost	3,75,00,000	-	3,75,00,000
7.	Production Overheads	4,50,00,000	65,00,000	5,15,00,000
8.	Total Cost of Production (4+5+6+7)	23,75,00,000	11,15,00,000	34,90,00,000

| 9. | Gross Profit (3 - 8) | 1,25,00,000 | 3,85,00,000 | 5,10,00,000 |

Production Overheads

Figures in ₹

Particulars	Amount
Inspection and Testing	3,45,00,000
Space Maintenance Cost for Subcontracting Work (rent, utilities, 2 support staff to maintain storage)	50,00,000
Other Production Overheads (rest of the utilities, rent, salary of support staff at storage)	1,20,00,000

Required

1. DISCUSS the difference in treatment of production overheads under absorption costing and activity based costing.

2. LIST the steps to implement activity based costing within Melody.

3. ASSESS whether activity based costing would be suitable for the Piano and Keyboard Divisions.

4. ADVISE Melody about the activity based management and ways to improve business performance.

Solution:-

(i) **Product cost under absorption costing method includes all manufacturing costs that are incurred to produce a product {direct material, labour, and overheads (both fixed and variable)}.** The allocation of overhead is determined by a single cost driver based on volume of production (popular ones are machine hours or direct labour hours). This driver is applied to the entire production overhead to arrive at the production overhead rate. For example, in the given problem, labour hours are being used to allocate overheads to Pianos and Keyboards. All production overheads are allocated to products based on this driver irrespective of whether this resource was used by the product or not. For example, production overheads include maintenance cost relating to space for subcontracting work. This cost is incurred for the manufacture of Piano alone. This portion of the maintenance cost gets clubbed with other production costs. Eventually, an overhead absorption rate is calculated using the ratio direct labour hours for each product. Absorption costing would ignore the fact that the manufacture of Keyboards does not utilize the space allocated for subcontracting work. This skews the product costing by erroneously inflating the cost of Keyboards, some portion of the cost of manufacturing Pianos passes onto the product cost for Keyboards. Application of a single cost driver may not be the most appropriate way of allocating costs between products. For example, in the given problem, factory rent that is clubbed with total overheads and applied to the product cost as part of the overhead rate. Absorption costing ignores that direct labour may not be the most appropriate basis to allocate factory rent overhead to the products.

Activity based costing identifies the cost of each activity and assigns costs to units produced based on the number of activities used by each unit. Instead of being clubbed as a single overhead cost, costs for each activity are captured in their respective cost pools. The most appropriate cost driver is selected. Cost drivers could be volume based (machine hours / direct labour) or transaction based

(# of purchase orders). This cost driver is used as the basis to allocate costs to various products based on the utilization of the resource related to that activity. Overhead costs are assumed to be variable, determined (or driven) by the selected cost driver. Here, the cost of maintaining space for subcontracting relates entirely to the manufacture of Pianos. Using ABC method, this cost will be allocated only to Piano products since allocation is now based on utilization of the resource to manufacture the product. Again, under this method, factory rent could have space utilization as the cost driver. Therefore, using ABC method, the allocation of rent overhead to the products will be made on a more logical basis as compared to absorption costing.

To conclude, product costing using absorption costing is relatively simpler, a method regularly followed for financial accounting purpose. Product costing using ABC method results in more detailed yet accurate figures. It highlights the cost / benefit of various activities that helps management focus on eliminating non-value added activities.

(2) Implementation of ABC Method within Melody would include the following steps:

Activity Mapping: Production process has to be first broken down into various activities. Based on their nature, activities must then be clubbed to form activity pools. Activity pools must then tie in with the products or services.

Cost Pools: Overheads costs are then identified to each activity pools. This gives the cost pool for each category of activity.

Cost Driver: Identify the activity that bring about the cost. For example, space utilization would be a standard cost driver for factory rent. Cost drivers could be volume based or transaction based.

Overhead Rate: Once the cost pool and cost driver are identified, the cost per unit of cost driver (overhead rate) is determined.

Overhead Cost Allocation: Depending on how much of the resource (cost driver) the product utilizes, the cost is allocated accordingly to that product.

Product Cost: The allocated overhead cost is added to the cost of direct materials and labour to arrive at the full cost of production for the unit.

(3) Appropriateness of ABC Method for the Keyboard and Piano Divisions

The Piano Division receives numerous requests for customization from its customers. While it produces only 1,000 Pianos in a year, no two customizations are the same. Therefore, the range of Pianos manufactured by Melody can be considered varied. Production overheads cost, including subcontracting work, form 35% of the total production cost. ((₹ 3,75,00,000 + ₹ 4,50,00,000)/ ₹ 23,75,00,000). Therefore, overheads form a substantial portion of product cost. Due to the variety in customization, it is important to price each customization at a rate that will yield an acceptable profit margin to Melody. To do this, manufacturing process has to be segregated into various activities and cost pools. Depending on utilization of resources related to each activity, each Piano can be sold at an appropriate price. If a Piano requires more of a resource from an activity, this can be included in the product cost and factored into the selling price, such that even with customization an acceptable profit margin can be earned. Thus, ABC method can help Melody arrive at a more accurate cost of production as compared to absorption costing.

While, overhead cost is one aspect of ABC analysis, the other information that an organization gets from this framework is that it can identify the activities that add value to the product. At the same time, non-value adding services can be identified (for example storage) and measures can be taken to minimize them. This helps it partner better with its customers and gain a competitive edge.

The Keyboard Division produces 10,000 Keyboards annually, all sold as a standard product with no

customization. Activities are standardized, with no variation in the process between the Keyboards. Production overheads form only 6% of total cost of production. (₹ 65,00,000 / ₹ 11,15,00,000). Implementation of ABC method is time consuming and complex. Here, due to the standardized nature of production and low quantum of production overheads, ABC method may not be justified for the time and effort involved. In this case, absorption costing may seem to be a more practical approach to arrive at product price.

(4) Activity Based Management to help Melody improve business performance

Activity based management can help Melody to meet the customer needs while using the lowest possible resource or cost. ABM can be used at an operational or strategic level.

Product Pricing

This would be especially in case of the Piano Division. As explained above, ABC method would enable Melody calculate a more accurate cost of production for each Piano. Currently, the cost of subcontracting work used for customizing Pianos is ₹ 3,75,00,000. This is being charged to the customers with a 10% mark-up to cover for any incidental overhead. However, this is very simplistic. As such the mark-up that can be earned under this method will be ₹ 37,50,000. However, the cost of maintenance of the area for subcontracting work is higher at ₹ 50,00,000. Therefore, it can be concluded that Melody is not recovering the entire portion of the incidental overheads incurred by providing the subcontracting work.

By identifying the cost pools relating to the subcontracting work, Piano Division can determine that it is making a loss on the subcontract work as a whole. It could therefore adjust the price of customized Pianos such that it earns an acceptable margin on each sale. This is at an operational level. At a strategic level, Melody can determine which type of customizations are most profitable. Customizations that are not very frequent, too complex, and costly may be avoided as it takes away resources from Melody in terms of labour, space etc. At the same time, careful consideration should be given to such decisions since it is this customization service that gives Melody an edge over other competitors. Therefore, Melody should take decisions that help it balance the customer base, while keeping the costs low and processes as standardized as possible.

Analysis of Activities

Implementation of ABC method forces the company to take a more detailed look at its activities that comprise of its manufacturing process. It may be found that certain activities can be performed in more efficient manner. Also, activities can be identified as that that add value to the product and those that are not value adding. For example, in the given example, storage is not a value adding activity. Melody can work on a system where it optimizes the production process such that storage requirements are lower. The inventory turnover of Piano can also be improved, since quicker the Piano is shipped to the customer, lower the space requirement. Inspection is another non- value adding activity. For example, Melody switch to a standardized procurement system for its raw materials from reputed suppliers. While it may be a costlier option, this may lead to lower defects in the product, therefore requiring lesser need for inspection.

Performance Measurement

Employee resource should be used more towards value adding activities. Proper training would be required to ensure acceptable quality of work. This would automatically reduce non-value adding activities like rework, idle time, and inspection. There has to be proper information system in place that captures such data. This is facilitated through the implementation of ABC costing method and use of ABM. However, to have a successful system, senior management need to be committed to this model, proper communication and training has to be given to employees. To implement such a

performance system the management has to commit sufficient time and effort. Cost benefit considerations of having such systems should also be taken into consideration. To conclude, implementing ABM should not take up productive time of employees and become a non- value activity in itself.

Question 33:–

Well-known Footwear (WF) is a shop that focuses on shoes for various sports and activities like jogging, cricket, tennis, and hockey. Budgeted profit for the WF is calculated considering an average selling price of ₹ 500 per pair of shoes and an average cost of ₹ 350 per pair of shoes. The supervisor of the WF has discretion in staffing and in setting prices. Usually, the WF is staffed for 650 hrs. per month at a budgeted rate of ₹ 125 per hr. In addition to this base wages, sales staff gets a payment equal to 5.5% of takings. Moreover, staffing levels are not expected to change in response to "little" changes in shoe sales. For Sep'2020, the WF had budgeted sales of 2,250 pairs of shoes and 650 staffing hrs. Actual results for Sep'2020 were as follows:

Pairs of shoes sold	2,500
Revenue	12,00,000
Less: Cost of shoes	8,25,000
Less: Staff – additional payment	66,000
Less: Staff – base wages @₹ 125 per hour	78,125
Profit	₹ 2,30,875

Note- "little" changes in shoe sales specified as ± 12%.

Required

(i) PREPARE a reconciliation statement of budgeted profit to actual profit.

(ii) COMMENT on supervisor's performance.

Solution

(i) **Reconciliation Statement Budgeted and Actual Profit (Sep'2020)**

Budgeted profit	1,94,375
Sales volume variance (F)	30,625
Sales price variance (A)	50,000
Shoe cost variance (F)	50,000
Staff cost variance -commission (F)	2,750
Staff cost variance -base wage (F)	3,125
Actual profit	₹ 2,30,875

(ii) **Comment**

The performance seems good. It shows that the supervisor of the WF passed on a 5.7% decrease in shoe cost to customers (same is also revealed through the entirely offsetting of the shoe cost variance and price variance), i.e. shoe costs decreased by ₹ 20 per pair, from a standard cost of

₹ 350 per pair to an actual cost ₹ 330 per pair. Additionally, the selling price decreased by ₹ 20 per pair, from a standard price of ₹ 500 per pair to an actual price of ₹ 480 per pair. In turn, the reduction in the selling price appeared to produce a favourable sales volume variance and a reasonable increase in profit.

Since the reduction in the selling price, staff commissions also were lower than budgeted. Moreover, the ₹ 50,000 reduction in revenue led to 0.055 × ₹ 50,000 = ₹ 2,750 less in commission costs.

Lastly, staffing was 25 hours under budget, leading to a savings of 25 × ₹ 125 = ₹ 3,125. Therefore, the supervisor attained an increase in sales with lesser staff hours.

Overall, it appears that the manager has done a great job of making revenue and controlling costs.

Workings

Statement Showing Budgeted and Actual Profit (Sep'2020)

	Budgeted Data	Actual Data
Units (pairs of shoes)	2,250	2,500
Price per pair of shoes	₹ 500.00	₹ 480.00
Cost per pair of shoes	₹ 350.00	₹ 330.00
Commission rate	₹ 27.50 (5.5% of ₹ 500)	₹ 26.40 (5.5% ₹ 480)
Contribution	₹ 122.50	₹ 123.60
Revenue	₹ 11,25,000	₹ 12,00,000
Less: Cost of shoes	7,87,500	8,25,000
Less: Staff – additional payment (commission)	61,875	66,000
Less: Staff – base wages	81,250	78,125
Profit	₹ 1,94,375	₹ 2,30,875

Computation of variances		
Total Profit Variance	=	₹ 2,30,875 – ₹ 1,94,375 = ₹ 36,500 (F)
Sales Contribution Volume Variance	=	Standard Contribution – Budgeted Contribution
	=	₹ 122.50 × 2,500 – ₹ 122.50 × 2,250
	=	₹ 3,06,250 – ₹ 2,75,625 = ₹ 30,625 (F)

Sales Price Variance	=	Actual Revenue – Standard Revenue
	=	₹ 480 × 2,500 – ₹ 500 × 2,500
	=	₹ 12,00,000 – ₹ 12,50,000 = ₹ 50,000 (A)
Shoe Cost Variance *	=	₹ 350 × 2,500 – ₹ 330 × 2,500
Staff Cost Variance-commission* Staff Cost Variance (base wage)	=	₹ 8,75,000 – ₹ 8,25,000 = ₹ 50,000 (F)
	=	₹ 27.50 × 2,500 – ₹ 26.40 × 2,500
	=	₹ 68,750 – ₹ 66,000 = ₹ 2,750 (F)
	=	₹ 81,250 – ₹ 78,125 = ₹ 3,125 (F).

(*) Note- The cost variance (for both shoe and staff-commission) equal to the difference between the standard cost and the actual cost.

Question 34:–

Queensland Chemicals (QC) manufactures high-quality chemicals C-1, C-2 and C-3. Extracts from the budget for last year are given below:

	C-1	C-2	C-3
Sales Quantity (kg)	1,000	3,250	750
	₹ / kg	₹ / kg	₹ / kg
Average Selling Price	17,600	2,560	22,400
Direct Material (C2H6O) Cost	8,000	1,280	9,600
Direct Labour Cost	3,200	480	4,800
Variable Overhead Cost	320	48	480

The budgeted direct labour cost per hour was ₹ 160. Actual results for last year were as follows:

	C-1	C-2	C-3
Sales Quantity (units)	900	3,875	975
	₹ / kg	₹ / kg	₹ / kg
Average Selling Price	19,200	2,480	20,000
Direct Material(C2H6O) Cost	8,800	1,200	10,400
Direct Labour Cost	3,600	480	4,800
Variable Overhead Cost	480	64	640

The actual direct labour cost per hour was ₹ 150. Actual variable overhead cost per direct labour hour was ₹ 20. QC follows just in time system for purchasing and production and does not hold any inventory.

Required

INTERPRET the Sales Mix Variance and Sales Quantity variance in terms of contribution.

Solution

Variance Interpretation

The sales quantity variance and the sales mix variance describe how the sales volume contribution variance has been affected by a change in the total quantity of sales and a change in the relative mix of products sold.

From the figures arrived for the sales quantity contribution variance, we can observe that the increase in total quantity sold would have gained an additional contribution of ₹ 2,124,600, if the actual sales volume had been in the budgeted sales proportion.

The sales mix contribution variance shows that the variation in the sales mix resulted in a curtailment in profit by ₹ 570,600. The change in the sales mix has resulted in a relatively higher proportion of sales of C-2 which is the chemical that earns the lowest contribution and a lower proportion of C-1 which earn a contribution significantly higher. The relative increase in the sale of C-3 however, which has the highest unit contribution, has partially offset the switch in mix to C-2.

Workings

Statement Showing Standard Contribution

	C-1 ₹ / kg	C-2 ₹ / kg	C-3 ₹ / kg
Average Selling Price	17,600	2,560	22,400
Direct Material (C2H6O) Cost	8,000	1,280	9,600
Direct Labour Cost	3,200	480	4,800
Variable Overhead Cost	320	48	480
Contribution	6,080	752	7,520

Sales Contribution Mix Variance

Products	Actual Quantity [AQ]	Actual Sales at Budgeted Proportion [RAQ]	Difference [AQ – RAQ]	Contribution ₹ [SC]	Mix Variance (₹ ' 000) SC × [AQ – RAQ]
C-1	900	1,150	250 (A)	6,080	1,520 (A)
C-2	3,875	3,737.50	137.50 (F)	752	103.40 (F)
C-3	975	862.50	112.50 (F)	7,520	846 (F)
	5,750	5,750			570.60 (A)

Sales Contribution Quantity Variance

Products	Budget Sales Quantity [BQ]	Actual Sales at Budgeted Proportion [RAQ]	Difference [RAQ – BQ]	Contribution ₹ [SC]	Qty. Variance (₹ ' 000) SC × [RAQ – BQ]
C-1	1,000	1,150	150 (F)	6,080	912 (F)

C-2	3,250	3,737.50	487.50 (F)	752	366.60 (F)
C-3	750	862.50	112.50 (F)	7,520	846 (F)
	5,000	5,750			2,124.60 (F)

Question 35:-

Managing Director of Petro-KL Ltd (PTKLL) thinks that Standard Costing has little to offer in the reporting of material variances due to frequent change in price of materials.

PTKLL can utilize one of two equally suitable raw materials and always plan to utilize the raw material which will lead to cheapest total production costs. However, PTKLL is frequently trapped by price changes and the material actually used often provides, after the event, to have been more expensive than the alternative which was originally rejected.

During last accounting period, to produce a unit of 'P' PTKLL could use either 2.50 Kg of 'PG' or 2.50 kg of 'PD'. PTKLL planned to use 'PG' as it appeared it would be cheaper of the two and plans were based on a cost of 'PG' of ₹ 1.50 per Kg. Due to market movements, the actual prices changed and if PTKLL had purchased efficiently the cost would have been:

'PG' ₹ 2.25 per Kg;

'PD' ₹ 2.00 per Kg

Production of 'P' was 1,000 units and usage of 'PG' amounted to 2,700 Kg at a total cost of₹ 6,480/-

Required

CALCULATE the material variance for 'P' by:

(i) Traditional Variance Analysis; and

(ii) An approach which distinguishes between Planning and Operational Variances.

Solution:-

(i)　Traditional Variances

Usage Variance = (2,500 Kg – 2,700 Kg) × ₹ 1.50

= ₹ 300 (A)

Price Variance = (₹ 1.50 – ₹ 2.40) × 2,700 Kg

= ₹ 2,430 (A)

Total Variance = ₹ 300 (A) + ₹ 2,430 (A)

= ₹ 2,730 (A)

(ii)　Operational Variances

Usage Variance = (2,500 Kg – 2,700 Kg) × ₹ 2.25

= ₹ 450 (A)

Price Variance = (₹ 2.25 – ₹ 2.40) × 2,700 Kg

$$= ₹ \ 405 \ (A)$$

Total Variance $= ₹ \ 450 \ (A) + ₹ \ 405 \ (A)$

$$= ₹ \ 855 \ (A)$$

(iii)   Planning Variances

Controllable Variance $= (₹ \ 2.00 – ₹ \ 2.25) × 2,500 \ Kg$

$$= 625 \ (A)$$

Uncontrollable Variance $= (₹ \ 1.50 – ₹ \ 2.00) × 2,500 \ Kg$

$$= 1,250 \ (A)$$

Total Variance $= ₹ \ 625 \ (A) + ₹ \ 1,250 \ (A)$

$$= ₹ \ 1,875 \ (A)$$

Reconciliation $= ₹ \ 855 \ (A) + ₹ \ 1,875 \ (A)$

$$= ₹ \ 2,730 \ (A)$$

A Planning Variance simply compares a revised standard to the original standard. An Operational Variance simply compares the actual results against the revised amount. Controllable Variances are those variances which arises due to inefficiency of a cost centre /department. Uncontrollable Variances are those variances which arises due to factors beyond the control of the management or concerned department of the organization.

Planning variances are generally not controllable. Where a revision of standards is required due to environmental/ technological changes that were not anticipated at the time the budget was prepared, the planning variances are truly uncontrollable. However, standards that failed to anticipate known market trends when they were set will reflect faulty standard-setting: it could be argued that these variances were controllable at the planning stage.

Question 36:-

Krishna is Chief Financial Officer of millets.com, an internet company that enables customer to order for delivery of different millets by accessing its website. Krishna is concerned with the efficiency and effectiveness of the financial function. He collects the following information for three finance activities in 2020.

Rate per unit of Cost Driver

Activity	Activity Level	Cost Driver	Static Budget Amount (₹)	Actual Amount (₹)
Receivables	Output	Remittance	6.39	7.50

	unit			
Payables	Batch	Invoices	29.00	28.00
Travel expenses	Batch	Travel claims	76.00	74.00

The output measure is the number of deliveries which is the same as the number of remittances. The following additional information are also given:

	Budgeted	Actual
Number of deliveries	10,00,000	9,48,000
Delivery Batch size	5	4.468
Travel expenses Batch size	500	501.587

Required

CALCULATE the flexible budget variances for 2020 to :

(i) Receivable Activities

(ii) Payable Activities

(iii) Travel expense Activities (Ignore fractions in all calculations)

Solution:-

Activity-based costing, flexible-budget variances for finance function activities:

(i) Receivables

'Receivables' is an output unit level activity. Its flexible-budget variance can be calculated as follows:

Flexible Budget Variance

=	Flexible Budget Costs – Actual Costs
=	₹ 6.39 × 9,48,000 – ₹ 7.50 × 9,48,000
=	₹ 60,57,720 – ₹ 71,10,000
=	₹ 10,52,280 (A)

(ii) Payables

'Payables' is a batch level activity.

		Static-Budget Amounts	Actual Amounts
a.	Number of deliveries	10,00,000	9,48,000
b.	Batch size (units per batch)	5	4.468
c.	Number of batches (a / b)	2,00,000	2,12,175

d.	Cost per batch	₹ 29	₹ 28
e.	Total payables activity cost (c×d)	₹ 58,00,000	₹ 59,40,900

Step 1: The number of batches in which payables should have been processed

=   9,48,000 actual units / 5 budgeted units per batch

=   189,600 batches

Step 2: The flexible-budget amount for payables

=   1,89,600 batches × ₹ 29 budgeted cost per batch

=   ₹ 54,98,400

The flexible-budget variance can be computed as follows:

Flexible-Budget Variance

=   Flexible-Budget Costs – Actual Costs

=   1,89,600 × ₹ 29 – 2,12,175 × ₹ 28

=   ₹ 54,98,400 – ₹ 59,40,900

=   ₹ 4,42,500 (A)

(iii)   Travel Expenses

Travel expenses is a batch level activity.

		Static-Budget Amounts	Actual Amounts
a.	Number of deliveries	10,00,000	9,48,000
b.	Batch size (units per batch)	500	501.587
c.	Number of batches (a / b)	2,000	1,890
d.	Cost per batch	₹ 76	₹ 74
e.	Total travel expenses activity cost (c×d)	₹ 1,52,000	₹ 1,39,860

Step 1: The number of batches in which the travel expense should have been processed

=   948,000 actual units/ 500 budgeted units per batch

=   1,896 batches

Step 2: The flexible-budget amount for travel expenses

=   1,896 batches × ₹ 76 budgeted cost per batch

=   ₹ 1,44,096

The flexible budget variance can be calculated as follows:

Flexible Budget Variance

=   Flexible-Budget Costs – Actual Costs

=   1,896 × ₹ 76 – 1,890 × ₹ 74

=   ₹ 1,44,096 – ₹ 1,39,860

=   ₹ 4,236 (F)

Question 37:-

WDG Limited uses activity based costing to allocate variable manufacturing overhead costs to products. The company identified three activities with the following information for last quarter:

Activity	Standard Rate	Standard Quantity per unit produced	Actual Costs	Actual Quantity
Indirect Materials	₹ 20 per kilogram	0.5 kilogram per unit	₹ 9,40,000	48,000 kilogram
Product Testing	₹ 3 per test minute	10 minutes per unit	₹ 22,50,000	7,40,000 test minutes
Energy	₹ 0.20 per minute of machine time	4 minutes of machine time per unit	₹ 70,000	3,60,000 minutes of machine time

The company produced 80,000 units in the last quarter. Company policy is to investigate all variances above 5% of the flexible budget amount for each activity.

Required

(i) CALCULATE variable overhead expenditure variance and variable overhead efficiency variance for each of the activities using activity based costing. Clearly indicate each variance as favourable or unfavourable / adverse.

(ii) INTERPRET the results of variable overhead efficiency variance as calculated in (i) above in respect of indirect materials and product testing activity.

(iii) IDENTIFY the variances that should be investigated according to company policy. Show calculations to support your answer.

Solution:-

(i)   **Indirect Materials**

Efficiency Variance = Cost Impact of undertaking activities more/ less than standard

= (0.50kg. × 80,000units – 48,000 kg.) × ₹ 20

= ₹ 1,60,000 (A)

Expenditure Variance = Cost impact of paying more/ less than standard for actual activities undertaken

	=	48,000kg. × ₹ 20 – ₹ 9,40,000
	=	₹ 20,000 (F)

Product Testing

Efficiency Variance	=	Cost Impact of undertaking activities more/ less than
		standard
	=	(10 mins. × 80,000 units – 7,40,000 mins.) × ₹ 3
	=	₹ 1,80,000 (F)
Expenditure Variance	=	Cost impact of paying more/ less than standard for actual activities undertaken
	=	7,40,000mins × ₹ 3 – ₹ 22,50,000
	=	₹ 30,000 (A)

Energy

Efficiency Variance	=	Cost Impact of undertaking activities more/ less than
		standard
	=	(4 mins. × 80,000 units – 3,60,000 mins.) × ₹ 0.20
	=	₹ 8,000 (A)
Expenditure Variance	=	Cost impact of paying more/ less than standard for actual activities undertaken
	=	3,60,000mins × ₹ 0.20 – ₹ 70,000
	=	₹ 2,000 (F)

(ii) Indirect Materials

WDG actually spent 48,000 kg. or 8,000 kg. more than the standard allows. At a predetermined rate of ₹ 20 per kg., efficiency variance is 1,60,000 (A). Since actual quantity was higher than the standard, the variance is unfavorable. This adverse variance, could have been caused by the inferior quality, result of carelessness handling of materials by production workers or could be as a result of change in methods of production, product specifications or the way in which quality of the product is checked or controlled.

Product Testing

Favorable efficiency variance amounting to ₹ 1,80,000 indicates that fewer testing minutes were expended during the quarter than the standard minutes required for the level of actual output. This may be due to employment of a higher skilled labor or improvement of skills of existing workforce through training and development leading to improved productivity etc.

(iii) Flexible Budget

Indirect	= (0.50 kg. × 80,000 units) ×	=	₹ 8,00,000×

Materials	₹ 20 = ₹ 8,00,000	5% = ₹ 40,000
Product Testing	= (10 mins. × 80,000 units) × ₹ 3 = ₹ 24,00,000	= ₹ 24,00,000 × 5% = ₹ 1,20,000
Energy	= (4 mins. × 80,000) × ₹ 0.20 = ₹ 64,000	= ₹ 64,000 × 5% = ₹ 3,200

Efficiency Variance for all the three activities are more than 5% of their flexible budget amount. So, according to the company policy, efficiency variances should be investigated.

Alternative

Statement Showing Identification of Variances to be investigated

	Calculation	Variance % of Flexible Budget	Criteria	Investigate Y or N
Indirect Materials				
Efficiency Variance	$\left(\dfrac{1,60,000}{8,00,000} X100\right)$	20%	5%	Y
Expenditure Variance	$\left(\dfrac{20,000}{8,00,000} X100\right)$	2.5%	5%	N
Product Testing				
Efficiency Variance	$\left(\dfrac{1,80,000}{24,00,000} X100\right)$	7.5%	5%	Y
Expenditure Variance	$\left(\dfrac{30,000}{24,00,000} X100\right)$	1.25%	5%	N
Energy				
Efficiency Variance	$\left(\dfrac{8,000}{64,000} X100\right)$	12.5%	5%	Y
Expenditure Variance	$\left(\dfrac{2,000}{64,000} X100\right)$	3.125%	5%	N

Question 38:-

Established in the year 1999, FF Company is the pioneer of fast food in Southampton. It delivers a truly fresh, affordable, made to order sandwiches, burger, and other meal in a friendly and relaxed environment. The popularity of the sandwiches, burger etc. continued to grow over the decades but one thing remained the same and that was its core values and principles

Always provide exceptional service to valued guests;

Provide the highest quality menu items at a price everyone can afford and enjoy; and

Keep operating costs low and ensure to have great systems in place and never stop improving.

It provides a comfortable place for people to unwind over interesting conversations. From the beginning, as it continues to grow, it is guided by passion for delighting customers by serving fresh, delicious food right in front of customer.

The performance report* for FY 2020-21 was presented at the management committee meeting as follows:

Particulars	Budget	Actual	Variance
Sales / Production (no. of burgers)	2,00,000	1,65,000	(35,000)
Sales (£)	10,50,000	8,46,450	(2,03,550)
Less: Variable Costs (£)	6,33,000	5,37,075	95,925
Less: Fixed Costs (£)	1,57,500	1,65,000	(7,500)
Profit	2,59,500	1,44,375	(1,15,125)

*burger segment

The Management Accountant of FF believed that the size of the fast-food market deriving the budget number of burgers to be sold is over-estimated. He has computed the value of the sales volume contribution planning variance to be 26,062.50 adverse.

Further, the report also included customer's feedback and the majority of comments were

regarding delay in service time. One of feedback was as follows:

"I ordered two burgers at 2:10 pm. After half an hour (30 minutes) of waiting I called the waiter and asked him what happened? he told me that he will check with kitchen. I got the order after 45 minutes of waiting, this cafe is not good in delivery time"

The budgeted data shown in the table is based on the assumption that total market size would be 4,00,000 units.

Required

(i) PREPARE a reconciliation statement of budgeted profit to actual profit through marginal costing approach in as much detail as possible.

(ii) EXPLAIN the implications of the reconciliation statement.

(iii) Management is worried about customer's feedback. ADVISE measures to improve delivery service time.

Solution:-

Statement of Reconciliation - Budgeted Vs Actual Profit

Particulars	£
Budgeted Profit	2,59,500
Less: Sales Volume Contribution - Planning Variance (Adverse)	26,062.50
Less: Sales Volume Contribution - Operational Variance (Adverse)	46,912.50
Less: Sales Price Variance (Adverse)	19,800
Less: Variable Cost Variance (Adverse)	14,850
Less: Fixed Cost Variance (Adverse)	7,500
Actual Profit	1,44,375

Workings

Basic Workings

Budgeted Market Share (in %) = $\frac{2,00,0000}{4,00,000}$ = 50%

Budgeted Contribution   =   £10,50,000 – £6,33,000 = £4,17,000

Average Budgeted Contribution (per unit)

= $\frac{£4,17,000}{2,00,000}$ = £2.085

Volume Contribution Planning = Budgeted Market Share % × (Actual Industry

Sales Quantity in units – Budgeted Industry Sales Quantity in units) × (Average Budgeted Contribution per unit)

⇒ £26,062.50 (A) = 50% × (Actual Industry Sales Quantity in

units – 4,00,000 units) × £2.085

⇒ Actual Industry Sales Quantity = 3,75,000 units

Actual Market Share (in %) = $\frac{1,65,000}{3,75,000}$ = 44%

Standard Sales Price per unit = $\frac{£10,50,000}{2,00,000}$ = £5.25

Actual Sales Price per unit = $\frac{£8,46,450}{1,65,000}$ = = £5.13

Standard Variable Cost per unit = $\frac{£6,33,000}{2,00,000}$ = £3.165

Actual Variable Cost per unit = $\frac{£5,37,075}{1,65,000}$ = £3.255

From Case Studies question

The Building Block Model (Concept)

Strategic Cost and Performance Management

Fitzgerald and Moon proposed a Building Block Model which suggests the solution of performance measurement problems in service industries. But it can be applied to other manufacturing and retail businesses to evaluate business performance. Variants of the Building block model are currently used in Australia in the regulation of electricity transmission and distribution, gas transmission and distribution, railways, postal services, urban water and sewerage services, irrigation infrastructure and port access.

Fitzgerald & Moon:

Equality

Achievable

Standards

Ownership

Dimension

Determinants

Rewards

Motivation

Clear

Controllability

Flexibility

Innovation

Results

Resource

Financial

F.I.R.Q.

Quality

Competitive