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PAPER – 5: STRATEGIC COST MANAGEMENT AND PERFORMANCE EVALUATION

Question No.1 is compulsory.

Answer any **four** questions from the remaining **five** questions.

Working notes should form part of the answers.

No statistical or other table will be provided with this question paper.

Wherever necessary, candidates may make appropriate assumptions and clearly state them.

Question 1

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

- 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.
(5 Marks)
- 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.
(6 Marks)

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- (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? **(5 Marks)**
- (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. **(4 Marks)**

Answer

- (a) (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 $\{\text{₹}16 + (\text{₹}25 - \text{₹}16)\} = \text{₹}25/-$.
- 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 $\{\text{₹}130 - (\text{₹}50 + \text{₹}40) - \text{₹}25\} = \text{₹}15/-$ 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 $(\text{₹}130 - \text{₹}50 - \text{₹}40) = \text{₹}40/-$. 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 2

Rohni Steel Company produces three grades of steel - super, good and normal grade. Each of these products (Grades) has high demand in the market and company is able to sell as much as it can produce these products.

The furnace operation is a bottle-neck in the process. The company is running at 100% of capacity. The company wants to improve its profitability. The variable conversion cost is ₹100 per process hour. The fixed cost is ₹48,00,000. In addition, the Cost Accountant was able to determine the following information about the three products (grades):

	Super Grade	Good Grade	Normal Grade
Budgeted Units Produced	6,000	6,000	6,000
Total process hours per unit	12	12	10
Furnace hours per unit	6	5	4
Unit Selling Price	₹3,600	₹3,400	₹3,000
Direct Material cost per unit	₹2,100	₹1,900	₹1,720

The furnace operation is part of the total process for each of these three products. Thus furnace hours are the part of process hours.

Required

- (i) DETERMINE the unit contribution margin for each product. (5 Marks)
- (ii) Give an ANALYSIS to determine the relative product profitability, assuming that the furnace is a bottleneck. (5 Marks)
- (iii) Managements wishes to improve profitability by increasing prices on selected products. At what price would super and good grades need to be offered in order to produce the same relative profitability as normal grade steel? (10 Marks)

Answer

- (i) **Contribution Margin per unit**

Particulars	Super Grade (₹)	Good Grade (₹)	Normal Grade (₹)
Selling Price per unit	3,600	3,400	3,000
Less: Variable Conversion Cost per unit	1,200 (₹100 × 12 hrs.)	1,200 (₹100 × 12 hrs.)	1,000 (₹100 × 10 hrs.)
Less: Direct Material Cost per unit	2,100	1,900	1,720
Contribution Margin per unit	300	300	280

- (ii) The contribution margin per unit may give false signals when an organization has production bottlenecks. Instead, Company should use the contribution margin per bottleneck hour to determine relative product profitability, as follows:

Particulars	Super Grade	Good Grade	Normal Grade
Contribution Margin per unit (₹)	300	300	280
Furnace Bottleneck hrs. per unit	6	5	4
Contribution Margin per furnace hour	50	60	70

Analysis

The Super and Good Grade steel have the highest contribution margin per unit (₹300); however, the normal grade has the highest contribution margin per furnace hour (₹70). Thus, using production bottleneck analysis indicates that the Normal Grade is actually more profitable at a ₹70 contribution margin per furnace hour than Super Grade's ₹50 or Good Grade's ₹60 contribution margin per furnace hour.

Therefore, the company would want to sell product in the following preference order:

- I. Normal Grade

II. Good Grade

III Super Grade

(iii) One way is to revise the pricing would be to increase the price to the point where all three products produce profitability equal to the highest profit product. This would be determined as follows:

Contribution Margin per furnace hour for Normal Grade =

$$\frac{\text{Revised Price of Super Grade - Variable Cost per unit of Super Grade}}{\text{Furnace Hours of Super Grade per unit}}$$

Or

$$₹ 70 = \frac{\text{Revised Price of Super Grade} - ₹(1,200 + 2,100)}{6 \text{ hrs.}}$$

$$\text{Or, } ₹ 420 = \text{Revised Price of Super Grade} - ₹ 3,300$$

Super grade steel would require a revised price of **₹3,720** in order to deliver the same contribution margin per bottleneck hour as does Normal Grade steel.

Contribution Margin per furnace hour for Normal Grade =

$$\frac{\text{Revised Price of Good Grade - Variable Cost per unit of Good Grade}}{\text{Furnace Hours of Good Grade per unit}}$$

Or

$$₹ 70 = \frac{\text{Revised Price of Good Grade} - ₹(1,200+1,900)}{5 \text{ hrs.}}$$

Good grade steel would require a revised price of **₹3,450** in order to deliver the same contribution margin per bottleneck hour as does Normal Grade steel.

Question 3

Trident Toys Ltd. manufactures a single product and the standard cost system is followed. Standard cost per unit is worked out as follows:

	₹
Materials (10 Kgs. @ ₹4 per Kg)	40
Labour (8 hours @ ₹8 per hour)	64
Variable overheads (8 hours @ ₹3 per hour)	24
Fixed overheads (8 hours @ ₹3 per hour)	24
Standard Profit	56

Overheads are allocated on the basis of direct labour hours. In the month of April 2018, there was no difference between the budgeted and actual selling price and there were no opening or closing stock during the period.

The other details for the month of April 2018 are as under

	Budgeted	Actual
Production and Sales	2,000 Units	1,800 Units
Direct Materials	20,000 Kgs. @ ₹4 per kg	20,000 Kgs. @ ₹4 per kg
Direct Labour	16,000 Hrs. @ ₹8 per Hr.	14,800 Hrs. @ ₹8 per Hr.
Variable Overheads	₹48,000	₹44,400
Fixed Overheads	₹48,000	₹48,000

Required

- I. RECONCILE the budgeted and actual profit with the help of variances according to each of the following method:
 - (a) The conventional method
 - (b) The relevant cost method assuming that
 - (i) Materials are scarce and are restricted to supply of 20,000 Kgs. for the period.
 - (ii) Labour hours are limited and available hours are only 16,000 hours for the period.
 - (iii) There are no scarce inputs. **(12 Marks)**
- II. COMMENT on efficiency and responsibility of the Sales Manager for not using scarce resources. **(8 Marks)**

Answer

(i) COMPUTATION OF VARIANCES

Material Usage Variance = Standard Price × (Standard Quantity – Actual Quantity)
 = ₹4.00 × (18,000* Kgs. – 20,000 Kgs.)
 = ₹ 8,000 (A)

$$* \left(1,800 \text{ units} \times \frac{20,000 \text{ Kgs.}}{2,000 \text{ units}} \right)$$

Labour Efficiency Variance = Standard Rate × (Standard Hours – Actual Hours)
 = ₹8.00 × (14,400* hrs. – 14,800 hrs.)
 = ₹3,200 (A)

$$* \left(1,800 \text{ units} \times \frac{16,000 \text{ hrs.}}{2,000 \text{ units}} \right)$$

Variable Overhead Efficiency Variance

$$\begin{aligned} &= \text{Standard Variable Overheads for Production} - \text{Budgeted Variable Overheads for Actual hours} \\ &= (14,400 \text{ hrs.} \times \text{Rs.}3.00) - (\text{₹}3.00 \times 14,800 \text{ hrs.}) \\ &= \text{₹}1,200 \text{ (A)} \end{aligned}$$

Fixed Overhead Volume Variance

$$\begin{aligned} &= \text{Absorbed Fixed Overheads} - \text{Budgeted Fixed Overheads} \\ &= (14,400 \text{ hrs.} \times \text{₹}3.00) - (16,000 \text{ hrs.} \times \text{₹}3.00) \\ &= \text{₹}4,800 \text{ (A)} \end{aligned}$$

Sales Margin Volume Variance = Standard Margin – Budgeted Margin

$$\begin{aligned} &= (1,800 \text{ units} \times \text{₹}56.00) - (2,000 \text{ units} \times \text{₹}56.00) \\ &= \text{₹}11,200 \text{ (A)} \end{aligned}$$

Sales Contribution Volume Variance

$$\begin{aligned} &= \text{Standard Contribution} - \text{Budgeted Contribution} \\ &= (1,800 \text{ units} \times \text{₹}80.00) - (2,000 \text{ units} \times \text{₹}80.00) \\ &= \text{₹}16,000 \text{ (A)} \end{aligned}$$

Statement Showing “Reconciliation Between Budgeted Profit & Actual Profit”

Particulars	Conventional Method (₹)	Relevant Cost Method (₹)		
		Scarce Material	Scarce Labour	No Scarce Inputs
Budgeted Profit (2,000 units × ₹56)	1,12,000	1,12,000	1,12,000	1,12,000
Sales Volume Variance	11,200 (A)	NIL*	12,000 [§] (A)	16,000 (A)
Material Usage Variance	8,000 (A)	24,000 (A)	8,000 (A)	8,000 (A)
Labour Efficiency Variance	3,200 (A)	3,200 (A)	7,200 (A)	3,200 (A)
Variable Overhead Efficiency Variance	1,200 (A)	1,200 (A)	1,200 (A)	1,200 (A)
Fixed Overhead Volume Variance	4,800 (A)	N.A.#	N.A.#	N.A.#
Actual Profit	83,600	83,600	83,600	83,600

NOTES

Scarce Material

Based on conventional method, direct material usage variance is ₹8,000 (A) i.e. 2,000 Kg. × ₹4. In this situation material is scarce, and, therefore, material cost variance based on relevant cost method should also include contribution lost per unit of material. Excess usage of 2,000 Kg. leads to lost contribution of ₹16,000 i.e. 2,000 Kgs. × ₹8. **Total material usage variance based on relevant cost method, when material is scarce will be: ₹8,000 (A) + ₹16,000 (A) = ₹24,000 (A).** Since labour is not scarce, labour variances are identical to conventional method.

Excess usage of 2,000 Kgs. leads to loss of contribution from 200 units i.e. ₹16,000 (200 units × ₹80). It is not the function of the sales manager to use material efficiently. Hence, loss of contribution from 200 units should be excluded while computing sales contribution volume variance.

(*)→

Therefore, sales contribution volume variance, when materials are scarce will be NIL i.e. ₹16,000 (A) - ₹16,000 (A).

Scarce Labour

Material is no longer scarce, and, therefore, the direct material variances are same as in conventional method. In conventional method, excess labour hours used are: 14,400 hrs. – 14,800 hrs. = 400 hrs. Contribution lost per hour = ₹10. Therefore, total contribution lost, when labour is scarce will be: 400 hrs. × ₹10 = ₹4,000. **Therefore, total labour efficiency variance, when labour hours are scarce will be ₹7,200 (A) i.e. ₹3,200 (A) + ₹4,000 (A).**

Excess usage of 400 hrs. leads to loss of contribution from 50 units i.e. ₹4,000 (50 units × ₹80). It is not the function of the sales manager to use labour hours efficiently. Hence, loss of contribution from 50 units should be excluded while computing sales contribution volume Variance.

(\$)→

Therefore, sales contribution volume variance, when labour hours are Scarce will be ₹12,000 (A) i.e. ₹16,000 (A) - ₹4,000 (A).

Fixed Overhead Volume Variance

(#) →

The fixed overhead volume variance does not arise in marginal costing system. In absorption costing system, it represents the value of the under or over absorbed fixed overheads due to change in production volume. When marginal costing is in use there is no overhead volume variance, because marginal costing does not absorb fixed overheads.

(ii) **Comment on Efficiency and Responsibility of the Sales Manager**

In general, Gross Profit (or contribution margin) is the joint responsibility of sales managers as well as of production managers. *On one hand the sales manager is responsible for the sales revenue part, on the other hand the production manager is accountable for the cost-of-goods-sold component.* However, it is the top management who needs to ensure that the target profit is achieved by the organization. *The sales manager is accountable for prices, volume, and mix of the product, whereas the production manager must control the costs of materials, labour, factory overheads and quantities of production. The purchase manager must purchase materials at budgeted prices. The personnel manager must employ right people at the right place with appropriate wage rates.* The internal audit manager must ensure that the budgetary figures for sales and costs are being adhered by all departments which are directly or indirectly involved in contribution of making profit. Thus, sales manager is not responsible for contribution lost due to excess usage or inefficient usage of resources in case of scarce resources. Hence, such contribution lost must be excluded from the sales contribution volume variance.

Question 4

(a) *A company is planning to improve its profit level at least by 10% from the preliminary budget estimates of a profit of ₹32,80,000 for the coming year. It has worked out the following profit improvement plan:*

(i) *In the year just concluded the sales of the company were 10% of the total market of 12,00,000 units. For the preparation of the original budget estimate, the same market demand and the same share of market for the company was envisaged. Now it has been estimated that the total market demand will increase by 18% and the company's market share will increase to 11% from the present level of 10%.*

(ii) *The products are sold in two sizes - large and medium. The sales mix of each size was 50:50 so far. Now it is planned that the sales will be 40% of large and 60% of medium. The medium packs and large packs have a contribution of ₹10 and ₹8 per pack respectively. The budget proposes to raise the price in such a manner that the contribution per pack will increase by ₹0.60 for each size.*

(iii) *There will be an additional expenditure on sales promotion worth ₹78,000.*

(iv) *The company proposes to save ₹9,000 by saving on interest cost in the coming year by better financial management.*

You are required to draw a profit improvement plan in financial terms and spell out separately the effect of various factors on profit. **(10 Marks)**

(b) *MNP Co. Ltd. makes digital watches. The company is preparing a product life cycle budget for a new watch. Development on the new watch is to start shortly. Estimates for new watch are as under:*

Life Cycle Units Manufactured and Sold	2,40,000
Selling Price Per Watch	(₹) 500
Life Cycle Costs:	
R&D and Design Cost	(₹) 80 Lakh
Manufacturing:	
Variable Cost Per Watch	(₹) 120
Variable Cost Per Batch	(₹) 4,000
Watches Per Batch	300
Fixed Costs	(₹) 112 lakh
Marketing:	
Variable Cost Per Batch	(₹) 24
Fixed Costs	(₹) 8 Lakh
Distribution:	
Variable Cost Per Watch	(₹) 240
Watches Per Batch	96
Fixed Costs	(₹) 45 Lakh
Customer Service Cost Per Watch	(₹) 10

Required

(i) CALCULATE the budgeted life cycle operating income for, the new watch. (5 Marks)

OR

SUGGEST the strategies to be adopted by the MNP Co. Ltd. to develop a new watch.

(5 Marks)

(ii) What percentage of the budgeted total product life cycle costs will be incurred by the end of the R&D and design stage? (2 Marks)

(iii) An analysis reveals that 75% of the budgeted total life cycle costs of new watch will be locked in at the R&D and design stage. What are the implications for managing costs of the new watch? (3 Marks)

Answer

(a) Statement Showing Change in Profit

Particulars	Large (₹)	Medium (₹)	Total (₹)
I. Effect of Product Mix Changes			
Revised Estimated Sales Quantity (Ratio 40:60)	62,304	93,456	1,55,760

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Revised Estimated Sales Quantity (Ratio 50:50)	77,880	77,880	1,55,760
Difference in Sales Quantity	(15,576)	15,576	NIL
Contribution Effect Thereon @ ₹8.60 and ₹10.60	(1,33,953.60)	1,65,105.60	31,152
II Effect of Volume Change			
Revised Estimate of Sales Quantity (50:50)	77,880	77,880	
Original Estimate of Sales Quantity (50:50)	60,000	60,000	
Difference in Sales Quantity	17,880	17,880	35,760
Contribution Effect Thereon @ ₹8 and ₹10	1,43,040	1,78,800	3,21,840
III. Effect of Price Change			
Revised Estimate of Sales Quantity (Ratio 40:60)	62,304	93,456	1,55,760
Difference in Price p.u.	0.60	0.60	0.60
Contribution Effect	37,382.40	56,073.60	93,456
IV. Effect of Expenses			
Sales Promotion Expenses			(78,000)
Savings in Interest			9,000
Overall Increase in Profit			3,77,448

Total Improvement in Profit ₹3,77,448 (11.51%).

Workings

Budget for Original and Revised Contribution

Particulars	Original Budget Estimate		Revised Estimate	
	Description	(₹)	Description	(₹)
Market- Sales Quantity	12,00,000 units		14,16,000	
Company's Share	1,20,000 units (10% of total)		1,55,760 units (11% of total)	
Sales Quantity				
Large	60,000 units (50% of mix)		62,304 (40% of mix)	
Medium	60,000 units (50% of mix)		93,456 (60% of mix)	
Contribution Earned				
Large	60,000 units × ₹8	4,80,000	62,304 units × ₹8.60	5,35,814.40
Medium	60,000 units × ₹10	6,00,000	93,456 units × ₹10.60	9,90,633.60

Particulars	Original Budget Estimate		Revised Estimate	
	Description	(₹)	Description	(₹)
Effect of Expenses				
Sales Promotion		---		-78,000
Interest		---		9,000
Revised Contribution		10,80,000		14,57,448

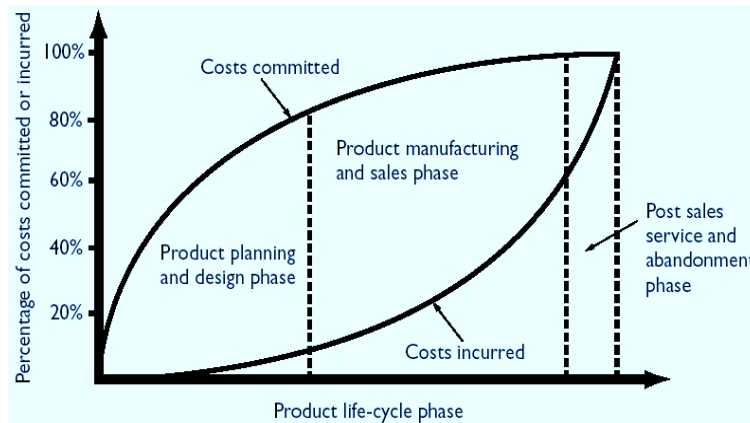


This question can also be solved by computing Sales Contribution Price Variance, Sales Contribution Mix Variance, Market Size Variance, Market Share Variance.

(b) (i) **Statement Showing Budgeted Life-Cycle Operating Income**

Particulars	(₹)
Revenues (₹500 × 2,40,000 units)	12,00,00,000
Less: R&D and Design Costs	80,00,000
Manufacturing Costs:	
Variable (₹120 × 2,40,000 units)	2,88,00,000
Batch $\left(2,40,000 \times \frac{₹4,000}{3,000} \right)$	32,00,000
Fixed	1,12,00,000
Marketing Costs:	
Batch (₹24 × 2,500* batches) *Assuming 1 Batch = 96 Pcs.	60,000
Fixed	8,00,000
Distribution Costs:	
Variable (₹ 240 × 2,40,000)	5,76,00,000
Fixed	45,00,000
Customer Service Cost (₹10 × 2,40,000)	24,00,000
Total Costs	11,65,60,000
Operating Income	34,40,000

Or



We can see from the above figure that approximately 80% of a product's cost are committed during the planning and design stage. At this stage product designers determine the product's design and the production process. In contrast, the majority of costs are incurred at the manufacturing stage, but they have already become locked in at the planning and design stage and are difficult to alter.

The pattern of cost commitment and incurrence will differ based on the industry and specific product introduced. For developing a watch, MNP Co. Ltd. needs to commit around 80,00,000 for its R&D and design Cost. So, Cost Management of MNP Co. Ltd can be most effectively exercised during the planning and design stage of its new watch and not at the manufacturing stage when the product design and processes have already been determined and costs have been committed. At this latter stage the focus is more on cost containment rather than on Cost Management. An understanding of life-cycle costs and how they are committed and incurred at different stages throughout a product's life cycle of the watch will also led to the emergence of target costing, a technique that focuses on managing costs during a product's planning and design phase.

- (ii) % of Budgeted Total Product Life-Cycle Costs incurred till the R & D and Design Stages:

$$\left(\frac{₹80,00,000}{₹11,65,60,000} \times 100 \right) = 6.86\%$$

- (iii) Implications:

An analysis reveals that 75%* of the total product life-cycle costs of the new watch will be locked in at the end of the R&D and design stages when only 6.86% of the costs are incurred (as calculated in the above case). *The implication is that it will be difficult to alter or reduce the costs of MNP digital watches once the design is finalised. To reduce and manage total costs, MNP must act to modify the design before costs get locked in.* (Question states 75%, hence 75% is taken)



This question can be solved by taking appropriate assumption in respect of **Marketing Costs** and **Distribution Costs**.

Question 5

- (a) 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. **(6 Marks)**
- (ii) What is your ADVICE to the company, if the company wants to achieve zero defect through a continuous quality improvement programme? **(2 Marks)**
- (iii) SUGGEST a suitable quality control level at a minimum cost. **(2 Marks)**
- (b) JM Ltd. is engaged in the manufacture of plastic bottles of a standard size. The factory has 5 machines of identical size, each capable of producing 40 bottles per hour. The variable cost per bottle is ₹0.32 and the selling price is ₹0.80 each. The company has received an offer from another company for manufacture of 40,000 units of a plastic moulded toy. The price per toy is ₹30 and the variable, cost is ₹24 each. In case of the company takes up the job, it has to meet the expenses of making a special mould required for the manufacture of the toy. The cost of the mould is ₹1,00,000. The company's time study analysis shows that the machines can produce only 16 toys per hour. The company has a total capacity of 10,000 hours during the period in which the toy is required to be manufactured. The fixed costs excluding the cost of construction of the mould during the period will be ₹10 Lakh.

The company has an order for the supply of 3,00,000 bottles during the period.

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Required

- (i) Do you ADVISE the company to take up the order for manufacturing plastic moulded toys during the time when it has an order in its book for the supply of 3,00,000 bottles. (3 Marks)
- (ii) If the order for the supply of bottles increases to 4,00,000 bottles, will you ADVISE the company to accept the order for the supply of plastic moulded toys? State the reasons. (3 Marks)
- (iii) An associate company of JM Ltd. has idle capacity and is willing to take up the whole or part of the manufacturing of the plastic moulded toys on sub-contracting basis. The subcontract price inclusive of the cost of construction of mould is ₹ 28 per toy. DETERMINE the minimum expected excess machine hour capacity needed to justify producing any portion of the toy order by the company itself rather than subcontracting. (4 Marks)

Answer

- (a) (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.

(b) Workings

Statement Showing “Contribution / Machine Hour”

	‘Bottle’	‘Toy’
Demand (units)	3,00,000	40,000
Sales (₹/u)	0.80	30.00
Less: Variable Cost (₹/u)	0.32	24.00
Less: Specific Fixed Cost (₹/u)	---	2.50
Contribution (₹/u)	0.48	3.50
Machine Hours Required per unit	0.025	0.0625
Contribution / Machine Hour	19.20	56.00

Advice on Supply of 3,00,000/ 4,00,000 Bottles

- (i) JM Ltd. can accept plastic molded toy’s order as sufficient number of hrs. i.e. 2,500 hrs. (10,000 hrs.- 3,00,000 bottles × 0.025 hrs.) are available and would be able to generate additional benefit of ₹3.50 per unit on 40,000 units of toys i.e. ₹1,40,000.
- (ii) If the order for the supply of bottles increases to 4,00,000 bottles, then 2,500 more hrs. will be required to produce the additional bottles. JM Ltd. has to decide whether to utilize 2,500 hrs. for existing bottle order or for toy Order.

Machine time is limiting factor. Therefore, contribution per machine hour from both the activities (i.e. bottles and toys) should be calculated to decide whether the order should be accepted. Contribution per hour is more in case of toys (refer workings). Therefore, JM Ltd. should utilize the remaining 2,500 hours for manufacturing toys rather than to fulfil the order for supply of additional bottles.

Prioritizing production based on contribution per machine hour would maximize profits. *However, existing order fulfilment is necessary for building long term and sustainable customer relationship.* Developing and maintaining long term and intimate relationships with the profitable customers provides valuable benefits to the company as the relationships between company and customers grow, a customer who is satisfied with the company’s products and services, tends to commit the relationship, and buy more over time. *Cost of keeping the existing customers is less expensive than the cost of acquiring new customers.*

Hence, JM Ltd. should be taken into consideration long term supplier relation before accepting the toy order based on financial consideration as contribution per hour is more in case of toys. Further, company may also explore outsourcing opportunities for production of toys.

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- (iii) Minimum number of toys needed to be manufactured to justify the increase in fixed cost of ₹1,00,000 to make the mould is 25,000 toys {1,00,000/ (₹28 - ₹24)}. Thus, as long as company has excess capacity available to manufacture more than 25,000 toys it is cheaper to produce than to buy from subcontractor.

$$\begin{aligned} \text{Minimum Expected Excess Capacity hours to justify} &= \left(\frac{25,000 \text{ toys}}{16 \text{ toys}} \right) \\ &= 1,562.5 \text{ or } 1,563 \text{ hours} \end{aligned}$$



This question has been solved by considering 7,500 hrs. (3,00,000 bottles/ 40 bottles per hr.) for bottles. This question can also be solved by taking alternative assumption as well.

Question 6

- (a) Hindustan Ltd. supplies the following information relating to a vital equipment used in its production activity for April, 2018:

Total time worked during the month	210 hrs.
Total production during the month	2,800 units.
No. of units accepted out of total production	2,520 units.
Standard time for actual production of the month	180 hrs.
Time lost during the month	28 hrs.

Required

- (i) STATE an appropriate approach to measure the total productive maintenance performance of an equipment. **(2 Marks)**
- (ii) Quantify the total productive maintenance performance of the above-mentioned equipment by using the approach stated in (i) above. **(6 Marks)**
- (iii) COMMENT on the effectiveness of maintenance of the equipment. **(2 Marks)**
- (b) ABC Airlines has two divisions organised as profit centres, the Passenger Division and the Cargo Division. The following divisional informations were given for the year ended 31st March 2018:

	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
Reservation	₹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) Does the income from operations for the two divisions accurately measure performance? **(3 Marks)**
- (ii) PREPARE the divisional income statement using the activity bases provided above in revising the service department charges. **(7 Marks)**

Answer

- (a) (i) The most important approach to the measurement of TPM performance is known as Overall Equipment Effectiveness (OEE) measure. The calculation of OEE measure requires the identification of “six big losses”
 1. Equipment Failure/ Breakdown
 2. Set-up/ Adjustments
 3. Idling and Minor Stoppages
 4. Reduced Speed
 5. Reduced Yield and
 6. Quality Defects and Rework

The first two losses refer to time losses and are used to calculate the availability of equipment. The third and fourth losses are speed losses that determine performance efficiency of equipment. The last two losses are regarded as quality losses.

$$\text{Performance} \times \text{Availability} \times \text{Quality} = \text{OEE} \%$$

OEE may be applied to any individual assets or to a process. It is unlikely that any manufacturing process can run at 100% OEE.

$$\begin{aligned} \text{(ii) Availability Ratio per shift} &= \left\{ \frac{210 \text{ hrs.}}{210 \text{ hrs.} + 28 \text{ hrs.}} \right\} \times 100\% \\ &= 88.24 \% \\ \text{Performance Ratio} &= \left\{ \frac{180 \text{ hrs.}}{210 \text{ hrs.}} \right\} \times 100\% \\ &= 85.71\% \\ \text{Quality Ratio} &= \left\{ \frac{2,520 \text{ units}}{2,800 \text{ units}} \right\} \times 100\% \\ &= 90.00\% \\ \text{Thus, OEE} &= 0.8824 \times 0.8571 \times 0.90 \\ &= 68.06\% \end{aligned}$$



This question has been solved by considering "Time Available equals to Total Time Worked plus Time Lost".

(iii) Comment

World Class OEE is 85% or greater, Hindustan Ltd.'s OEE is somewhere around 68%. It just means that company got some opportunities for improvement. Hindustan Ltd. may improve OEE by collecting information related to all downtime and losses on equipment, analyzing such information through graphs and charts, making improvement decisions thereon like autonomous maintenance, preventive maintenance, reduction in set up time etc. and implementing the same.

- (b) (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.

(ii)

ABC Airlines
Divisional Income Statement
For the Year Ended March 31, 2018

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 $\left(\frac{200}{1,000} \times ₹6,40,000\right)$	5,12,000 $\left(\frac{800}{1,000} \times ₹6,40,000\right)$	6,40,000
Flight Scheduling	1,75,000 $\left(\frac{350}{600} \times ₹3,00,000\right)$	1,25,000 $\left(\frac{250}{600} \times ₹3,00,000\right)$	3,00,000
Reservation	NIL	2,10,000 $\left(\frac{7,000}{7,000} \times ₹2,10,000\right)$	2,10,000
Operating Income	2,97,000	5,03,000	8,00,000

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