PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

QUESTIONS

Break-even Point (Batches)

1. DRB Ltd. is a leading Home Appliances manufacturer. The company uses just-in- time manufacturing process, thereby having no inventory. Manufacturing is done in batch size of 100 units which cannot be altered without significant cost implications. Although the products are manufactured in batches of 100 units, they are sold as single units at the market price. Due to fierce competition in the market, the company is forced to follow market price of each product. The following table provides the financial results of its four unique products:

	D_1	D_2	D_3	D_4	Total
Sales (units)	2,00,000	2,60,000	1,60,000	3,00,000	
	(₹)	(₹)	(₹)	(₹)	(₹)
Revenue	26,00,000	45,20,000	42,40,000	32,00,000	145,60,000
Less: Material Cost	6,00,000	18,20,000	18,80,000	10,00,000	53,00,000
Less: Labour Cost	8,00,000	20,80,000	12,80,000	12,00,000	53,60,000
Less: Overheads	8,00,000	7,80,000	3,20,000	12,00,000	31,00,000
Profit / (Loss)	4,00,000	(1,60,000)	7,60,000	(2,00,000)	8,00,000

Since, company is concerned about loss in manufacturing and selling of two products so, it has approached you to clear picture on its products and costs. You have conducted a detailed investigation whose findings are below:

The overhead absorption rate of ₹2 per machine hour has been used to allocate overheads into the above product costs. Further analysis of the overhead cost shows that some of it is caused by the number of machine hours used, some is caused by the number of batches produced and some are product specific fixed overheads that would be avoided if the product were discontinued. Other general fixed overhead costs would be avoided only by the closure of the factory. Numeric details are summarized below:

	₹	₹
Machine hour related……		6,20,000
Batch related……		4,60,000
Product specific fixed overhead:		
D_1……	10,00,000	
D_2……	1,00,000	
D_3……	2,00,000	
D_4……	1,00,000	14,00,000
General fixed overheads……		6,20,000
		31,00,000

The other information is as follows:-

	D_1	D_2	D_3	D_4	Total
Machine Hours	4,00,000	3,90,000	1,60,000	6,00,000	15,50,000
Labour Hours	1,00,000	2,60,000	1,60,000	1,50,000	6,70,000

Required

(i) Prepare a profitability statement that is more useful for decision making than the profit statement prepared by DRB Ltd.

(ii) Calculate the break-even volume in batches and also in approximate units for Product 'D_1'.

Pareto Analysis

2. The following information is given about the type of defects during a production period and the frequencies of their occurrence in a spectacle manufacturing company:

Defect	No. of items
End Frame not equidistant from the centre	10
Non-uniform grinding of lenses	60
Power mismatches	20
Scratches on the surface	110
Spots / Stains on lenses	5
Rough edges of lenses	70
Frame colours-shade differences	25

Required

Construct a frequency table so that a Pareto Chart can be constructed for the defect type. Which areas should the company focus on?

Flexible Budget

3. XEH Ltd. Had prepared fixed and flexible budget for the financial year 2019-20 as under:

	Fixed Budget *for full capacity* (₹)	**Flexible Budget *for 75% level*** (₹)
Sales	13,50,000	10,12,500
Direct Material	4,25,000	3,18,750
Direct Labour	1,85,000	1,38,750
Variable Overheads	2,15,000	1,61,250
Semi-Variable Overheads	3,65,000	3,23,750
Profit	1,60,000	70,000

After the closing of the financial year 2019-20, total actual sales stood at ₹11,07,000 and there was a favourable sales price variance of ₹17,000 (F).

Required

Prepare a flexible budget for the actual level of sales.

Decision Making

4. A company manufactures three components, A, B and C. these components pass through machines P and Q. The machine hour capacity of Q is limited to 7,800 hours a month. The company is interested in fulfilling the market demand to retain its market share. The following information is given:

		A	B	C
Demand (units/ month)		1,200	1,200	1,500
Variable cost (₹ / unit)		187	215	111
Fixed cost (₹/ unit) (at normal capacity utilization)		115	115	55
Hours per unit	P	2	2	1½
	Q	3	3	1

Component B has to be made by the company. There is a supplier available for components A and C at ₹ 280 and ₹ 161 per unit respectively.

Required

(i) Which component(s) and in what quantities should be purchased to minimize costs?

(ii) From a financial perspective, what do you need to ensure in order to justify your answer in (i) above?

Standard Costing

5. Sapporo Manufacturing Co. (SMC) is a leading consumer goods company. The budgeted and actual data of SMC for the year 2019-20 are as follows:-

Particulars	Budget	Actual	Variance
Sales / Production (units)	2,00,000	1,65,000	(35,000)
Sales (₹)	21,00,000	16,92,900	(4,07,100)
Less: Variable Costs (₹)	12,66,000	10,74,150	1,91,850
Less: Fixed Costs (₹)	3,15,000	3,30,000	(15,000)
Profit	5,19,000	2,88,750	(2,30,250)

The budgeted data shown in the table is based on the assumption that total market size would be 4,00,000 units but it turned out to be 3,75,000 units.

Required

Prepare a statement showing reconciliation of budget profit to actual profit through marginal costing approach for the year 2019-20 in as much detail as possible.

Cost Plus Pricing

6. The budgeted cost data of a product manufactured by XYZ Co. 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.

Linear Programming

7. The manufacturing company has 100 kg of A, 180 kg of B and 120 kg of C ingredients available per month. Company can use these materials to make three basic products namely 5-10-5, 5-5-10 and 20-5-10, where the numbers in each case represent the percentage of weight of A, B and C respectively in each of products. The cost of these raw materials are as follows:

Ingredient	Cost per Kg. (₹)
A	64
B	16
C	40
Inert Ingredients	16

Selling price of these products are ₹32.60, ₹34.80, and ₹36.00 per Kg, respectively. There is capacity restriction of the company product 5-10-5, so that company cannot produce more than 30 Kg per month.

Required

Formulate this problem as an LP model to determine the productions (in Kg.) of each product which will maximise its monthly profit.

Note: Formulate Only

Transportation Problem

8. Coupers Partners a leading CA firm has three managers. Each manager can work up to 176 hours during the next month, during which time three assignments must be completed. Tax Accounting (TA) Assignment will take 143 hours, Tax Performance Advisory (TPA) will take 154 hours, and Global Compliance & Reporting (GCR) will take 176 hours. The amount per hour that can be billed for assigning each manager to each assignment is given below:

Manager	Assignment		
	TA (₹)	TPA (₹)	GCR (₹)
C_1	1,800	2,250	2,850
C_2	2,100	1,950	1,800
C_3	2,400	2,100	2,250

Required

Formulate this as a transportation problem and find the optimal solution. Also find out the maximum total billings during the next month.

Note: A manager may be involved in more than one assignment.

Transfer Pricing

9. AWB Ltd. has two divisions Division W and Division B. Division W produces product Z, which it sells to external market and also to Division B. Divisions in the AWB Ltd. are treated as profit centres and divisions are given autonomy to set transfer prices and to choose their supplier. Performance of each division measured on the basis of target profit given for each period.

Division W can produce 1,00,000 units of product Z at full capacity. Demand for product Z in the external market is for 70,000 units only at selling price of ₹2,500 per unit. To produce product Z Division W incurs ₹1,600 as variable cost per unit and total fixed overhead of ₹4,00,00,000. Division W has employed ₹12,00,00,000 as working capital, working capital is financed by cash credit facility provided by its lender bank @ 11.50% p.a. Division W has been given a profit target of ₹2,50,00,000 for the year.

Division B has found two other suppliers C Ltd and H Ltd. who are agreed to supply product Z.

Division B has requested a quotation for 40,000 units of product Z from Division W.

Required

(i) Calculate the transfer price per unit of product Z that Division W should quote in order to meet target profit for the year.

(ii) Calculate the two prices Division W would have to quote to Division B, if it became AWB Ltd. policy to quote transfer prices based on opportunity costs.

Simulation

10. Finance Controller of Dunk Limited has drawn the following projections with probability distribution:

Raw Material		Wages & Other Variable Overheads		Sales	
₹ in 000	**Probability**	**₹ in 000**	**Probability**	**₹ in 000**	**Probability**
08 – 10	0.2	11 – 13	0.3	34 – 38	0.1
10 – 12	0.3	13 – 15	0.5	38 – 42	0.3
12 – 14	0.3	15 – 17	0.2	42 – 46	0.4
14 – 16	0.2			46 – 50	0.2

Opening cash balance is ₹40,000 and fixed cost is estimated at ₹15,000 per month.

Required

Simulate cash flow projection and expected cash balance at the end of the sixth month. Use the following single digit random numbers.

Raw Material	4 3 1 0 4 6
Wages & Other Variable Overheads	2 7 9 1 8 9
Sales	0 6 6 0 2 8

Balanced Scorecard

11. "Hard Rock Coconut" is an exclusive resort located in a famous Island of Pacific Ocean that vows to isolate its guests from the hustle and bustle of everyday life. Its leading principle is "all contemporary amenity wrapped in old-world charisma". Each of the resort's 18 villas has a separate theme like Castle, Majestic, Ambassador, Royal Chateau, Coconut, Lemon, Balinese etc and guests often ask for a specific villa when they make reservations. Villas are Ideal for families or friends travelling together and these villas feature luxurious accommodation spanning two floors. Since it is located within a 300-acre estate on white sand beach, the resort offers its guests a wide variety of outdoor activities such as horseback riding, hiking, diving, snorkeling, sailing, golf and so on. Guests could also while away the day relaxing in the pool and availing themselves of the resort's world-famous spa "Hard Coco Spa". The dining room, which only has three tables for the public, is acceptable proud of its 4-star rating.

Required

Develop a Balanced Scorecard for "Hard Rock Coconut". It is sufficient to give two measures in each of the four perspectives.

Learning Curve

12. Marketing manager of AV Ltd. has conducted a market research on the price-demand relationship for its consumer durable product 'K-2'. K-2 is a recently launched product. The price-demand pattern will be as follows:

Price per unit (₹)	Demand (units)
11,100	1,000
10,700	2,000
9,600	3,000
8,700	4,000

K-2 is produced in batches of 1,000 units. Production manager of AV Ltd. has also researched and studied the production pattern and has believe that 50% of the variable manufacturing cost would have learning and experience curve effect. This learning & experience curve effect will be continued upto 4,000 units of production at a constant rate. But after 4,000 units of production, unit variable manufacturing cost would be equal to the unit cost at the 4^{th} batch. The manufacturing unit cost of the first batch will be ₹4,400 of which only 50% is subjected to learning and experience curve effect. The average unit variable cost of all 4 batches will be ₹4,120.

Required

(i) Calculate the rate of learning that has been expected by the Production manager.

(ii) Calculate the price at which AV Ltd. should sell the K-2 in order to maximise its contribution.

Note

log0.93 = -0.0315, log2 = 0.3010, $2^{-0.1047}$ = 0.9299, $3^{-0.1047}$ = 0.8913, $4^{-0.1047}$ = 0.8649

Target Costing

13. A toy company 'T' expects to successfully launch Toy Z based on a film character. T must pay 15% royalty on the selling price to the film company. 'T' targets a selling price of ₹ 100 per toy and profit of 25% selling price.

The following are the cost data forecast:

	₹/toy
Component A	8.50
Component B	7.00
Labour: 0.4 hr. @ ₹ 60 per hr	24.00
Product specific overheads	13.50

In addition, each toy requires 0.6 kg of other materials, which are supplied at a cost of ₹ 16 per kg with a normal 4% substandard quality which is not usable in the manufacture.

Required

Determine if the above cost structure is within the target cost. If not, what should be the extent of cost reduction?

Cost Classification

14. ANZB Financial Services Limited is an Indian banking and financial services company headquartered in Chennai, Tamil Nadu. Apart from lending to individuals, the company grants loans to micro, small and medium business enterprises. Listed below are several costs incurred in the loan division of ANZB Financial Services Limited.

    (i) Remuneration of the loan division manager.

    (ii) Cost of Printer Paper, File Folders, View Binders, Ink, Toner & Ribbons used in the loan division.

    (iii) Cost of the division's MacBook Pro purchased by the loan division manager last year.

    (iv) Cost of advertising in business newspaper by the bank, which is allocated to the loan division.

    Cost Classification

Controllable by the loan division manager	Direct cost of the loan division	Sunk Cost
Uncontrollable by the loan division manager	Indirect Cost of the loan division	Out of Pocket Cost

Required

For each Cost, indicate which of the above mentioned Cost Classification best describe the cost.

Note- More than one classification may apply to the same cost item.

SUGGESTED ANSWERS

1. (i) Statement of Profitability of DRB Ltd

	Products (Amount in ₹)				
	D_1	**D_2**	**D_3**	**D_4**	**Total**
Sales	26,00,000	45,20,000	42,40,000	32,00,000	1,45,60,000
Direct Materials	6,00,000	18,20,000	18,80,000	10,00,000	53,00,000
Direct Wages	8,00,000	20,80,000	12,80,000	12,00,000	53,60,000
Overheads (W.N.2):					
Machine Related	1,60,000	1,56,000	64,000	2,40,000	6,20,000
Batch Related	1,00,000	1,30,000	80,000	1,50,000	4,60,000
Contribution	9,40,000	3,34,000	9,36,000	6,10,000	28,20,000
Product Specific Fixed Overheads	10,00,000	1,00,000	2,00,000	1,00,000	14,00,000
Gross Profit	(60,000)	2,34,000	7,36,000	5,10,000	14,20,000
General Fixed Overheads					6,20,000
Profit					8,00,000

(ii) Break-even Point

Total Sale Value of Product 'D_1' = ₹26,00,000

Total Contribution of Product 'D_1' = ₹9,40,000

Specific Fixed Overheads (Product D_1) = ₹10,00,000

Break-even Sales (₹) $= \frac{\text{Specific Fixed Cost}}{\text{Total Contribution}} \text{x} \text{Total Sales Value}$

$= \frac{₹10,00,000}{₹9,40,000} \text{x} ₹26,00,000$

$= ₹27,65,957.45$

Break-even Sales (units) $= \frac{₹27,65,957.45}{₹13.00} = 2,12,766 \text{ units}$

However, production must be done in batches of 100 units. Therefore, **2,128 batches** are required for break even. Due to the production in batches, 34 units (2,128 batches × 100 units – 2,12,766 units) would be produced extra. These 34 units would add extra cost ₹282.20 (34 units × ₹8.3*). Accordingly, break-even units as calculated above will increase by 22 units $\left(\frac{₹282.20}{₹13.00}\right)$.

(*) $\left(\dfrac{₹6,00,000 + ₹8,00,000 + ₹1,60,000 + ₹1,00,000}{2,00,000 \text{ units}}\right)$

Break-even units of product ‘D_1’ is 2,12,788 units (2,12,766 units + 22 units).

Workings

W.N.-1

Calculation Showing Overhead Rates

Overhead's Related Factors	Overhead Cost (₹) [a]	Total No. of Units of Factors [b]	Overhead Rate (₹) [a] / [b]
Machining Hours	6,20,000	15,50,000 hrs.	0.40
Batch Production	4,60,000	9,200 batches	50.00

W.N.-2

Statement Showing - Overhead Costs Related to Product

Particulars	D_1	D_2	D_3	D_4
Machining hrs. related overheads	₹ 1,60,000 (4,00,000 hrs × ₹0.40)	₹ 1,56,000 (3,90,000 hrs × ₹0.40)	₹ 64,000 (1,60,000 hrs × ₹0.40)	₹ 2,40,000 (6,00,000 hrs × ₹0.40)
Batch related overheads	₹1,00,000 (2,000 batches × ₹50)	₹1,30,000 (2,600 batches × ₹50)	₹80,000 (1,600 batches × ₹50)	₹1,50,000 (3,000 batches × ₹50)

2. Statement Showing "Pareto Analysis of Defects"

Defect Type	No. of Items	% of Total Items	Cumulative Total
Scratches on the surface	110	36.67%	36.67%
Rough edges of lenses	70	23.33%	60.00%
Non-uniform grinding of lenses	60	20.00%	80.00%
Frame colours-shade differences	25	8.33%	88.33%
Power mismatches	20	6.67%	95.00%
End frame not equidistant from the centre	10	3.33%	98.33%
Spots/ Strain on lenses	5	1.67%	100.00%
	300	100.00%	

The company should focus on eliminating *scratches on the surface*, *rough edges of lenses* and *grinding of lenses* related defects which constitute 80% portion, according to Pareto Theory.

3. Working Notes

(1) Calculation of Actual Sales at Budgeted Prices

	(₹)
Actual Sales at Actual Price	11,07,000
Less: Sales Price Variance (F)	17,000
Actual Sales at Budgeted Prices	10,90,000

$$\text{Activity Level} = \frac{\text{Actual Sales at Budgeted Prices}}{\text{Budgeted Sales at Full Capacity}} \times 100$$

$$= \frac{₹10,90,000}{₹13,50,000} \times 100$$

$$= 80.74...\%$$

(2) Segregation of Fixed & Variable Cost Element from Semi-Variable Overheads

$$\text{Variable Overhead} = \frac{\text{Overhead at Full Capacity - Overhead at 75\% Capacity}}{\text{Difference in Activity Level}}$$

$$= \frac{₹3,65,000 - ₹3,23,750}{25}$$

$$= ₹1,650$$

Fixed Overhead = Total SV Overheads at 100% Level – Variable Overheads at 100% level

= ₹3,65,000 – (₹1,650 × 100)

= ₹2,00,000

Flexible Budget at 80.74% Activity Level

	(Amount in ₹)
Sales	10,90,000
Less:	
Direct Material (₹4,25,000 × 80.74..%)	3,43,148
Direct Labour (₹1,85,000 × 80.74..%)	1,49,370
Variable Overheads (₹2,15,000 × 80.74..%)	1,73,593
Semi-Variable Overheads	

Variable Cost (₹1,650 × 80.74..) [W.N.-2]	1,33,222
Fixed Cost [W.N.-2]	2,00,000
Profit	90,667

4. (i) Statement Showing "Ranking for Manufacturing"

	A (₹)	B (₹)	C (₹)
Demand	1,200	1,200	1,500
Buy Price	280	×××	161
Less: Variable Cost	187	215	111
Saving in Cost *per unit*	93	×××	50
Hrs. Required -"Q"	3	3	1
Saving in Cost *per machine hour*	31	×××	50
Ranking	III	I	II

Statement Showing "Optimum Production Plan"

Product	Units	Machine Hrs./ Unit	Machine Hrs. Required	Balance Hrs.
B	1,200	3	3,600	4,200
C	1,500	1	1,500	2,700
A (Balance)	900*	3	2,700	---

* $\left(\frac{2{,}700\text{ hrs.}}{3\text{hrs.}}\right)$

Balance quantity of A, 300 units to be purchased from outside.

(ii) Statement Showing "Conditions for Justification (i)"

	Product A	Product C
Buy Price	< 337 *Or*	> 142
Variable Cost	> 130 *Or*	< 130

5. Statement of Reconciliation - Budgeted Vs Actual Profit

Particulars	**₹**
Budgeted Profit	5,19,000
Less: Sales Volume Contribution Planning Variance (Adverse)	52,125
Less: Sales Volume Contribution Operational Variance (Adverse)	93,825
Less: Sales Price Variance (Adverse)	39,600

Less: Variable Cost Variance (Adverse)	29,700
Less: Fixed Cost Variance (Adverse)	15,000
Actual Profit	2,88,750

Workings

Basic Workings

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

$= 50\%$

Actual Market Share (in %) $= \frac{1,65,000 \text{units}}{3,75,000 \text{units}}$

$= 44\%$

Budgeted Contribution = ₹21,00,000 – ₹12,66,000

= ₹8,34,000

Average Budgeted Contribution (*per unit)* $= \frac{₹8,34,000}{₹2,00,000}$

= ₹4.17

Budgeted Sales Price *per unit* $= \frac{₹21,00,000}{₹2,00,000}$

= ₹10.50

Actual Sales Price *per unit* $= \frac{₹16,92,900}{₹1,65,000}$

= ₹10.26

Standard Variable Cost *per unit* $= \frac{₹12,66,000}{₹2,00,000}$

= ₹6.33

Actual Variable Cost *per unit* $= \frac{₹10,74,150}{₹1,65,000}$

= ₹6.51

Calculation of Variances

Sales Variances:

Volume Contribution Planning*	=	Budgeted Market Share % × (Actual Industry Sales Quantity *in units* – Budgeted Industry Sales Quantity *in units*) × (Average Budgeted Contribution *per unit*)
	=	50% × (3,75,000 units – 4,00,000 units) × ₹4.17
	=	52,125 (A)
(*) *Market Size Variance*		
Volume Contribution Operational**	=	(Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity *in units*) × (Average Budgeted Contribution *per unit*)
	=	(44% – 50 %) × 3,75,000 units × ₹4.17
	=	93,825 (A)
(**) *Market Share Variance*		
Price	=	Actual Sales – Standard Sales
	=	Actual Sales Quantity × (Actual Price – Budgeted Price)
	=	1,65,000 units × (₹10.26 – ₹10.50) = 39,600 (A)

Variable Cost Variances:

Cost	=	Standard Cost for Production – Actual Cost
	=	Actual Production × (Standard Cost *per unit* – Actual Cost *per unit*)
	=	1,65,000 units × (₹6.33 – ₹6.51)
	=	₹29,700(A)

Fixed Cost Variances:

Expenditure	=	Budgeted Fixed Cost – Actual Fixed Cost
	=	₹3,15,000 – ₹3,30,000
	=	₹15,000 (A)

Fixed Overhead Volume Variance does not arise in a Marginal Costing system

6. 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* $\left(\frac{₹\ 1{,}00{,}00{,}000}{2{,}00{,}000\ \text{units}}\right)$	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), to sell all the budgeted units market price needs to be further lowered, which might be lower than the total cost of production.

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.

(ii) 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.

7. Let the P_1, P_2 and P_3 be the three products to be manufactured. Then the data are as follows:

Products	Product ingredients			
	A	B	C	Inert Ingredients
P_1	5 %	10%	5%	80%
P_2	5%	5%	10%	80%
P_3	20%	5%	10%	65%
Cost per kg (₹)	64	16	40	16

Cost of Product P_1

= 5% × ₹64 + 10% × ₹16 + 5% × ₹40 + 80% × ₹16

= ₹19.60 per kg

Cost of Product P2

= 5% × ₹64 + 5% × ₹16 + 10% × ₹40 + 80% × ₹16

= ₹20.80 per kg.

Cost of Product P3

= 20% × ₹64 + 5% × ₹16 + 10% × ₹40 + 65% × ₹16

= ₹28.00 per kg.

Let x_1, x_2, and x_3 be the quantity (in kg) of P_1, P_2, and P3 respectively to be manufactured. The LP problem can be formulated:

Objective function:

Maximise Z = (Selling Price - Cost Price) × Quantity of Product

= (₹32.60 − ₹19.60) x_1 + (₹34.80 − ₹20.80) x_2 + (₹36.00 − ₹28) x_3

= $13x_1 + 14 x_2 + 8 x_3$

Subject to Constraints:

$1/20\ x_1 + 1/20\ x_2 + 1/5\ x_3 \le 100$

Or $x_1 + x_2 + 4\ x_3 \le 2{,}000$

$1/10\ x_1 + 1/20\ x_2 + 1/20\ x_3 \le 180$

Or $2x_1 + x_2 + x_3 \le 3{,}600$

$1/20\ x_1 + 1/10\ x_2 + 1/10\ x_3 \le 120$

Or $x_1 + 2x_2 + 2x_3 \leq 2{,}400$

$x_1 \leq 30$

and $x_1, x_2, x_3 \geq 0$

8. The given information can be tabulated in following transportation problem-

Manager	Assignment			Time Available (Hours)
	TA (₹)	TPA (₹)	GCR (₹)	
C_1	1,800	2,250	2,850	176
C_2	2,100	1,950	1,800	176
C_3	2,400	2,100	2,250	176
Time Required (Hours)	143	154	176	

The given problem is an unbalanced transportation problem. Introducing a dummy assignment to balance it, we get-

Manager	Assignment				Time Available (Hours)
	TA (₹)	TPA (₹)	GCR (₹)	Dummy (₹)	
C_1	1,800	2,250	2,850	0	176
C_2	2,100	1,950	1,800	0	176
C_3	2,400	2,100	2,250	0	176
Time Required (Hours)	143	154	176	55	528

The objective here is to maximize total billing amount of the auditors. For achieving this objective, let us convert this maximization problem into a minimization problem by subtracting all the elements of the above payoff matrix from the highest payoff i.e. ₹2,850.

Manager	Assignment				Time Available (Hours)
	TA (₹)	TPA (₹)	GCR (₹)	Dummy (₹)	
C_1	1,050	600	0	2,850	176
C_2	750	900	1,050	2,850	176
C_3	450	750	600	2,850	176
Time Required (Hours)	143	154	176	55	528

Now, let us apply VAM method to the above matrix for finding the initial feasible solution.

Manager	Assignment				Time Avail. (Hours)	Difference
	TA (₹)	**TPA (₹)**	**GCR (₹)**	**Dummy (₹)**		
C_1	1,050	600	0 [176]	2,850	176/0	600 - -
C_2	750	900 [121]	1,050	2,850 [55]	176/55/0	150, 150 1,950
C_3	450 [143]	750 [33]	600	2,850	176/33/0	150, 300, 2,100
Time Required	143/0	154/121/0	176/0	55/0	528	
Difference	300	150	600	0		
	300	150	--	0		
	-	150	-	0		

The initial solution is given below. It can be seen that it is a degenerate solution since the number of allocation is 5. In order to apply optimality test, the total number of allocations should be 6 (m + n -1). To make the initial solution a non-degenerate, we introduce a very small quantity in the least cost independent cell which is cell of C_3, GCR.

Manager	Assignment			
	TA (₹)	**TPA (₹)**	**GCR (₹)**	**Dummy (₹)**
C_1	1,050	600	0 [176]	2,850
C_2	750	900 [121]	1,050	2,850 [55]
C_3	450 [143]	750 [33]	600 [e]	2,850

Let us test the above solution for optimality-

(u_i + v_j) Matrix for Allocated / Unallocated Cells

				u_i
-150	150	0	2,100	-600

	600	900	750	2,850	150
	450	750	600	2,700	0
v_j	450	750	600	2,700	

Now we calculate $\Delta_{ij} = C_{ij} - (u_i + v_j)$ for non basic cells which are given in the table below-

Δ_{ij} Matrix

1,200	450		750
150		300	
			150

Since, all allocations in $\Delta_{ij} = C_{ij} - (u_i+v_j)$are non negative, the allocation is optimal. The allocation of assignments to managers and their billing amount is given below:

Manager	Assignment	Billing Amount
C_1	Global Compliance & Reporting (GCR)	₹5,01,600 (176 hrs. × ₹2,850)
C_2	Tax Performance Advisory (TPA)	₹2,35,950 (121 hrs. × ₹1,950)
C_3	Tax Accounting (TA)	₹3,43,200 (143 hrs. × ₹2,400)
C_3	Tax Performance Advisory (TPA)	₹69,300 (33 hrs. × ₹2,100)
	Total Billing	₹11,50,050

9. (i) Transfer Price *per unit* of Product Z that Division W Should Quote *in order to meet* Target Profit

Quotation for the 40,000 units of product Z should be such that meet Division W's target profit and interest cost on working capital. Therefore the minimum quote for product Z will be calculated as follows:

Particulars	Amount (₹)
Target Profit (given for the year)	2,50,00,000
Add: Interest Cost on Working Capital (₹12,00,00,000 @11.5%)	1,38,00,000
Required Profit	3,88,00,000
Add: Fixed Overhead	4,00,00,000

Target Contribution	7,88,00,000
Less: Contribution Earned --- External Sales {60,000 units × (₹2,500 – ₹1,600)}	5,40,00,000
Contribution Required – Internal Sales	2,48,00,000
Contribution *per unit* of Product Z (₹2,48,00,000 ÷ 40,000 units)	620
Transfer Price of Product Z to Division B (Variable Cost *per unit* + Contribution *per unit*)	2,220

(ii) The Two Transfer Prices Based on Opportunity Costs

For the 30,000 units (i.e. maximum capacity – maximum external market demand) at variable cost of production i.e. ₹1,600 per unit.

For the next 10,000 units (i.e. external market demand – maximum possible sale) at market selling price i.e. ₹2,500 per unit.

10. Allocation of Random Numbers

Raw Material			Wages & Other Variable Overheads			Sales		
Mid Point	**Cum. Prob.**	**Random Nos.**	**Mid Point**	**Cum. Prob.**	**Random Nos.**	**Mid Point**	**Cum. Prob.**	**Random Nos.**
9	0.2	0 – 1	12	0.3	0 – 2	36	0.1	0
11	0.5	2 – 4	14	0.8	3 – 7	40	0.4	1 – 3
13	0.8	5 – 7	16	1.0	8 – 9	44	0.8	4 – 7
15	1.0	8 – 9				48	1.0	8 – 9

Simulation Table

(₹ in 000)

Month	Raw Material	Wages & Other V.O	Sales	Fixed Cost	Net Cash Flow	Cash Balancing (Opening ₹40 thousand)
1	11	12	36	15	-2	38
2	11	14	44	15	+ 4	42
3	9	16	44	15	+4	46
4	9	12	36	15	0	46
5	11	16	40	15	-2	44
6	13	16	48	15	+4	**48**

11. The following is a possible **Balanced Scorecard** for **"Hard Rock Coconut"**

Financial Perspective	Economic Value Added
	Revenue *per villa*
Customer Perspective	% repeat customers
	Number of customer complaints
Internal Business	Service rating of spa
	Staff hours *per guest*
	% cost spent for maintenance
	Travel guide rank for restaurant
Innovation and Learning	Employee retention
	Number of new services offered

12. (i) Variable cost per unit that will be effected by learning and experience curve is ₹2,200 (₹4,400 – 50% of ₹ 4,400).

Let, 'r' be the learning curve rate.

No. of Batch (x)	Cumulative Average Cost *per unit* (y)
1	2,200
2	2,200 r
4	2,200 r^2

If 2,200 r^2 = ₹1,920 (₹4,120 – 50% of ₹ 4,400)

r^2 = 0.8727

r = 0.934

Therefore, Learning Curve Effect = 93% (rounded off)

(ii) Calculation of Optimum Price

Price *per unit* (₹)	Demand (units)	Variable Cost *per unit* * [W.N.] (₹)	Variable Cost *per unit*** (₹)	Total Variable Cost *per unit* (₹)	Contribution *per unit* (₹)	Total Contribution (₹)
11,100.00	1,000	2,200.00	2,200.00	4,400.00	6,700.00	67,00,000
10,700.00	2,000	2,046.00	2,200.00	4,246.00	6,454.00	1,29,08,000
9,600.00	3,000	1960.86	2,200.00	4,160.86	5,439.14	1,63,17,420
8,700.00	4,000	1,902.78	2,200.00	4,102.78	4,597.22	1,83,88,880

(*) This represents variable cost part which is affected by the learning and experience curve effect.

(**) This represents variable cost part which is not affected by the learning and experience curve effect.

Working Note [W.N.]

Variable Cost *per unit*

Output in Batches (x)	Average Cost of the First Unit (a)	$x^{-0.1047}$	Cumulative Average Cost *per unit* (y)
1	2,200	1.0000	2,200.00
2	2,200	0.9299	2,046.00
3	2,200	0.8913	1,960.86
4	2,200	0.8649	1,902.78

y = ax^b

Where,

y = Cumulative average unit costs

a = Average cost of the first unit

x = Cumulative number of batches

b = Log of learning ratio ÷ Log of 2

= log 0.93 ÷ log 2

= −0.0315 ÷ 0.3010

= −0.1047

13. Statement Showing Target Cost "Z"

	₹ / Toy
Target Selling Price	100.00
Less: Royalty @15%	15.00
Less: Profit @ 25%	25.00
Target Cost	60.00

Statement Showing Cost Structure "Z"

	₹ / Toy
Component A	8.50
Component B	7.00
Labour (0.40 hr. × ₹ 60 per hr.)	24.00
Product Specific Overheads	13.50
Other Material (0.6 kg / 96% × ₹16)	10.00
Total Cost of Manufacturing	63.00

Total Cost of Manufacturing is ₹ 63 while Target Cost is ₹ 60. Company "T" should make efforts to **reduce its manufacturing cost by ₹ 3** to achieve Target Selling Price of ₹100.

14. Cost Incurred – Cost Classification

S. No.	Cost Incurred	Classification 1	Classification 2	Classification 3
(i)	Remuneration of the loan division manager.	Uncontrollable by the loan division manager.	Direct cost of the loan division.	Out of Pocket Cost
(ii)	Cost of Printer Paper, File Folders, View Binders, Ink, Toner & Ribbons used in the loan division.	Controllable by the loan division manager.	Direct cost of the loan division.	Out of Pocket Cost
(iii)	Cost of the division's MacBook Pro purchased by the loan division manager last year.	Controllable by the loan division manager.	Direct cost of the loan division.	Sunk Cost
(iv)	Cost of advertising in business newspaper by the bank, which is allocated to the loan division.	Uncontrollable by the loan division manager.	Indirect Cost of the loan division.	Out of Pocket Cost