PAPER – 5: ADVANCED MANAGEMENT ACCOUNTING

QUESTIONS

CVP Analysis

1. The budgeted results of P Ltd. as under:

Product	Sales Values (₹)	P / V Ratio (%)
A	2,50,000	50
B	4,00,000	40
C	6,00,000	30

Fixed overheads for the period is ₹5,02,200.

The management is worried about the results. You are required to prepare a statement showing the amount of loss, if any, being incurred at present and recommend a change in the sale value of each product as well as in the total sales value maintaining the same sales– mix, which will eliminate the said loss.

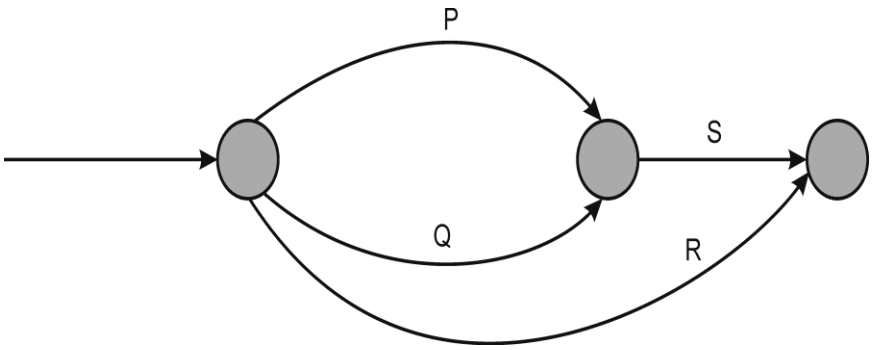
2. XY Ltd. makes two products X and Y, whose respective fixed costs are F_1 and F_2. You are given that the unit contribution of Y is one.fifth less than the unit contribution of X, that the total of F_1 and F_2 is ₹ 1,50,000, that the BEP of X is 1,800 units (for BEP of X F_2 is not considered) and that 3,000 units is the indifference point between X and Y.(i.e. X and Y make equal profits at 3,000 unit volume, considering their respective fixed costs). There is no inventory buildup as whatever is produced is sold.

Required

Find out the values F_1 and F_2 and units contributions of X and Y.

PERT/ CPM

3. The following is a part of a network.



What are activities P and Q called? How would you rectify the situation?

Life Cycle Costing

4. Kitchen King Ltd. (KKL) manufactures consumer durable products in a very highly competitive market. KKL is considering launching a new product 'Kitchen Care' into the market and gathered the following data:

Expected Market Price	₹5,000 per unit
Direct Material Cost	₹1,850 per unit
Direct Labour Cost	₹80 per hour
Variable Overhead Cost	₹1,000 per unit
Packing Machine Cost (specially to be purchased for this product)	₹5,00,000

KKL expects the selling price for the new product will continue throughout the product's life and a total of 1,000 units can be sold over the entire lifetime of the product.

Direct labour costs are expected to reduce as the volume of output increases due to the effects of 80% learning curve (index is -0.3219). The expected time to be taken for the first unit is 30 hours and the learning effect is expected to end after 250 units have been produced. Units produced after first 250 units will take the same time as the 250^{th} unit.

Required

(i) Calculate the expected total labour hours over the life time of the product 'Kitchen Care'.

(ii) Profitability of product 'Kitchen Care' that KKL will earn over the life time of the product.

(iii) Average target labour cost per unit over the life time of the product if KKL requires average profit of ₹800 per unit, to achieve its long term objectives.

Note: $250^{-0.3219} = 0.1691$, $249^{-0.3219} = 0.1693$

Total Quality Management

5. KNM Road Carriers is a transporting company that transports goods from one place to another. It measures quality of service in terms of:

(i) Time required to transport goods

(ii) On–time delivery

(iii) Number of lost or damaged cartons.

To improve its business prospects and performance the company is seriously considering to install a scheduling and tracking system, which involves an annual outlay of ₹1,25,000. The company furnishes the following information about its present and anticipated future performance:

	Current	Expected
On–time delivery	85%	95%
Variable costs per carton lost or damaged	₹55	₹55
Fixed costs per carton lost or damaged	₹45	₹45
Number of cartons lost or damaged	2,500	1,200

The company expects that each half per cent point increase in on–time performance will result in revenue increase of ₹9,000 per annum. Contribution margin of 45% is required.

Required

(i) Should KNM Road Carriers acquire and install the new system?

(ii) Also calculate additional amount of revenue required if benefits from new system is equal to cost & Contribution margin is 47.5%.

Just in Time

6. Haigh Ltd. is a leading manufacturing company. Under increasing pressure to reduce costs, to contain inventory and to improve service, Haigh's Costing Department has recently undertaken a decision to *implement a JIT System*.

The management of Haigh is convinced of the benefits of their changes. But Supplies Manager Mr. Smith fears with the Costing Department's decision. He said:

"We've been driven by suppliers for years ... they would insist that we could only purchase in thousands, that we would have to wait weeks, or that they would only deliver on Mondays!"

Required

Is Mr. Smith's view point correct and why?

Limiting Factor

7. List out the basis for deciding the priority of selecting the best product in the different circumstances stated below:

(i) When maximum sales (in value) is a limiting factor.

(ii) When raw-material is a limiting factor.

(iii) When labour hour is a limiting factor.

(iv) When there is a heavy demand for the product.

Budgetary Control

8. DTS Manufacturers Ltd. (DTSML) is specialist in the manufacturing of Industrial Products. They manufacture and market two types of products under the name 'L' and 'M'. Company produces two products from three basic raw materials 'N', 'O', and 'P'. Company follows a

13-period reporting cycle for budgeting purpose. Each period is four weeks long and has 20 working days. Data relating to the purchase of raw materials are presented below:

Raw Material	Purchase Price (Per Kg)	Standard Purchase Lot (Kg)	Reorder Point (Kg)	Projected Inventory Status *at the end of 5th period* (Kg)		Lead Time in Working Days
				On Hand	On Order	
N	₹ 1.00	90,000	72,000	96,000	90,000	10
O	₹ 2.00	30,000	45,000	54,000	-	25
P	₹ 1.00	60,000	60,000	84,000	60,000	20

Past experience has shown that adequate inventory levels for 'L' and 'M' can be maintained if 40 percent of the next period's projected sales are on hand at the end of a reporting period. Other relevant information is as follows:

Product	Raw Material Specifications			Projected Inventory Levels	Projected Sales		
	N	O	P	At the end of current (5th) period	6th Period	7th Period	8th Period
	Kg	Kg	Kg	Units	Units	Units	Units
L	1.25	0.50	-	18,000	45,000	52,500	57,000
M	2.00	-	1.50	16,800	42,000	27,000	24,000

The sales of 'L' and 'M' do not vary significantly from month to month. Consequently, the safety stock incorporated into the reorder point for each of the raw materials in adequate to compensate for variations in the sales of the finished products.

Raw materials orders are placed the day the quantity on hand falls below the reorder point. DTSML's suppliers are very trustworthy so that the given lead times are reliable.

The outstanding orders for raw materials 'N' and 'P' are due to arrive on the 10th and 4th working day of the 6th period, respectively. Payments for all raw material orders are remitted by the 10th day of the delivery.

You are required to determine the following items for raw materials 'N', 'O', and 'P' for inclusion in the 6th period report to management:

1. Projected quantities (in Kg) to be issued to production.
2. Projected quantities (in Kg) ordered and the date (in terms of working days) the order is to be placed.
3. The projected inventory balance (in Kg) at the end of the period.
4. The payments for purchases with due date.

Pricing Policy

9. State the appropriate pricing policy in each of the following independent situations:

(i) 'A' is a new product for the company and the market and meant for large scale production and long term survival in the market. Demand is expected to be elastic.

(ii) 'B' is a new product for the company, but not for the market. B's success is crucial for the company's survival in the long term.

(iii) 'C' is a new product to the company and the market. It has an inelastic market. There needs to be an assured profit to cover high initial costs and the usual sources of capital have uncertainties blocking them.

(iv) 'D' is a perishable item, with more than 80% of its shelf life over.

Learning Curve

10. XYZ International is developing a new product. During its expected life, 16,000 units of the product will be sold for ₹ 102 per unit.

Production will be in batches of 1,000 units throughout the life of the product.

The direct labour cost is expected to reduce due to the effects of learning for the first eight batches produced. Thereafter, the direct labour cost will remain constant at the same cost per batch as in the 8^{th} batch.

The direct labour cost of the first batch of 1,000 units is expected to be ₹ 55,000 and a 90% learning effect is expected to occur. The direct material and other non-labour related variable costs will be ₹ 50 per unit throughout the life of the product.

There are no fixed costs that are specific to the product.

The learning index for a 90% learning Curve = - 0.152; $8^{-0.152} = 0.729$; $7^{-0.152} = 0.744$

Required

(i) CALCULATE the expected direct labour cost of the 8^{th} batch.

(ii) CALCULATE the expected contribution to be earned from the product over its lifetime.

(iii) CALCULATE the rate of learning required to achieve a lifetime product contribution of ₹ 5,00,000, assuming that a constant rate of learning applies throughout the product's life.

Transfer Pricing

11. 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.

Linear Programming

12. Minimize

$$Z = 2x_1 - 3x_2 + 4x_3$$

Subject to the Constraints:

$$\begin{aligned} 3x_1 + 2x_2 + 4x_3 &\geq 9 \\ 2x_1 + 3x_2 + 2x_3 &\geq 5 \\ 7x_1 - 2x_2 - 4x_3 &\leq 10 \\ 6x_1 - 3x_2 + 4x_3 &\geq 4 \\ 2x_1 + 5x_2 - 3x_3 &= 3 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

Required

Find the dual problem for the above problem.

Cost Concepts

13. Some statements are given below. Identify name of the cost with examples and state whether it is relevant/non-relevant in decision making.

(i) Costs are historical costs which have already been incurred and cannot change by any decision made in future.

(ii) It is measure of benefits foregone by rejecting the second best alternative of resources in favour of the best.

(iii) It is portioning of cost which involves payments to outsiders i.e., it gives rise to cash expenditure as opposed to such costs as depreciation.

(iv) Total cost is changed (increase or decrease) due to change in the level of activity, technology or production process or method of production.

(v) Cost used in evaluation of a product to reflect the use of resources but that have no observable cost.

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/ HINTS

1. **Statement of Profitability**

Product	Sales Value (₹)	P / V Ratio (%)	Contribution (₹)
A	2,50,000	50	1,25,000
B	4,00,000	40	1,60,000
C	6,00,000	30	1,80,000
Total	12,50,000		4,65,000
Less: Fixed Overheads			5,02,200
Profit / (Loss)			(37,200)

Additional Sale Value of each Product

Product	Sales Value (₹)
A	₹74,400 (₹37,200 ÷ 0.5)
B	₹93,000 (₹37,200 ÷ 0.4)
C	₹1,24,000 (₹37,200 ÷ 0.3)

Additional Total Sales Value maintaining the same Sale – Mix

= ₹37,200 ÷ 0.372*

= ₹1,00,000

* Combined P / V Ratio = $\frac{\text{Total Contribution}}{\text{Total Sales}} \times 100$

= $\frac{\text{Rs. 4,65,000}}{\text{Rs. 12,50,000}} \times 100$

= 37.2%

2. Let C_x be the Contribution per unit of Product X.

Therefore Contribution per unit of Product Y = $C_y = 4/5C_x = 0.8C_x$

Given $F_1 + F_2 = 1,50,000$,

$F_1 = 1,800C_x$ (Break even volume × contribution per unit)

Therefore $F_2 = 1,50,000 – 1,800C_x$.

$3,000C_x – F_1 = 3,000 \times 0.8C_x – F_2$ or $3,000C_x – F_1 = 2,400\ C_x - F_2$ (Indifference point)

i.e., $3,000C_x – 1,800C_x = 2,400C_x – 1,50,000 + 1,800C_x$

i.e., $3,000C_x = 1,50,000$, Therefore C_x = ₹50/- (1,50,000 / 3,000)

Therefore Contribution per unit of X = ₹50

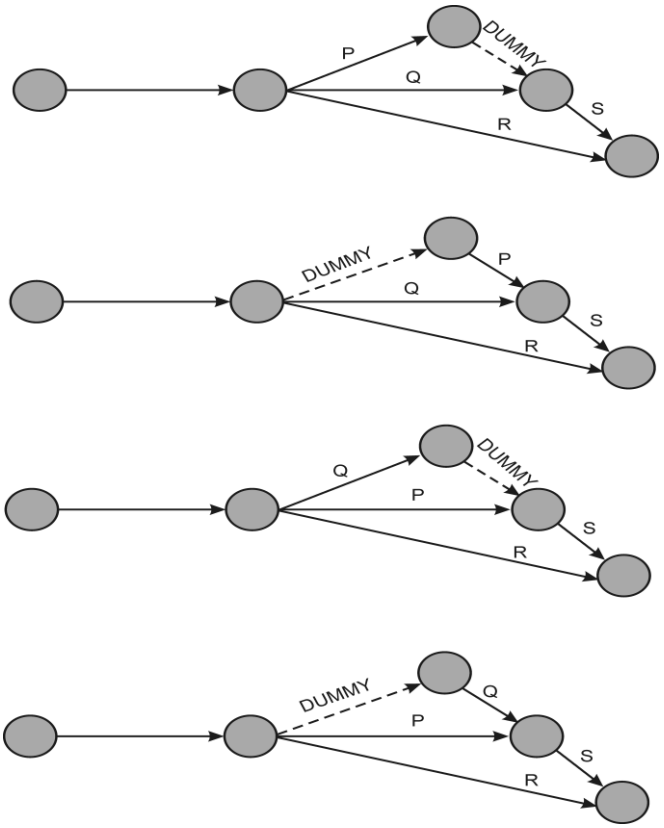
Fixed Cost of X = F_1 = ₹90,000 (1,800 × 50)

Therefore Contribution per unit of Y is ₹50 × 0.8 = ₹40 and

Fixed cost of Y = F_2 = ₹60,000 (1,50,000 – 90,000)

The value of F_1 = ₹90,000, F_2 = ₹60,000 and X = ₹50 and ₹40

3. Activities P and Q are called duplicate activities (or parallel activities) since they have the same head and tail events. The situation may be rectified by introducing a dummy either between P and S or between Q and S or before P or before Q (i.e. introduce the dummy before the tail event and after the duplicate activity or Introduce the dummy activity between the head event and the duplicate activity). Possible situations are given below:



4. (i) Calculation of 'Total Labour Hours' over the Life Time of the Product 'Kitchen Care'

The average time per unit for 250 units is

$$Y_x = ax^b$$

$$Y_{250} = 30 \times 250^{-0.3219}$$

$$Y_{250} = 30 \times 0.1691$$

$$Y_{250} = 5.073 \text{ hours}$$

Total time for 250 units = 5.073 hours × 250 units

= 1,268.25 hours

The average time per unit for 249 units is

$$Y_{249} = 30 \times 249^{-0.3219}$$

$$Y_{249} = 30 \times 0.1693$$

Y_{249} = 5.079 hours

Total time for 249 units = 5.079 hours × 249 units

= 1,264.67 hours

Time for 250th unit = 1,268.25 hours – 1,264.67 hours

= 3.58 hours

Total Time for 1,000 units = (750 units × 3.58 hours) + 1,268.25 hours

= 3,953.25 hours

(ii) Profitability of the Product 'Kitchen Care'

Particulars	**Amount (₹)**	**Amount (₹)**
Sales (1,000 units)		50,00,000
Less:Direct Material	18,50,000	
Direct Labour (3,953.25 hours × ₹80)	3,16,260	
Variable Overheads (1,000 units× ₹1,000)	10,00,000	31,66,260
Contribution		18,33,740
Less: Packing Machine Cost		5,00,000
Profit		13,33,740

(iii) Average 'Target Labour Cost' ***per unit***

Particulars	**Amount (₹)**
Expected Sales Value	50,00,000
Less: Desired Profit (1,000 units × ₹800)	8,00,000
Target Cost	42,00,000
Less: Direct Material (1,000 units × ₹1,850)	18,50,000
Variable Cost (1,000 units × ₹1,000)	10,00,000
Packing Machine Cost	5,00,000
Target Labour Cost	8,50,000
Average Target Labour Cost *per unit* (₹8,50,000 ÷ 1,000 units)	850

5. (i) Should KNM Road Carriers acquire and install the new system?

	₹
Additional Costs of the new scheduling & tracking system p.a.	1,25,000
Additional Revenue from improvement in on-time performance (₹9,000 × 10%/0.5%)	1,80,000
Contribution from Additional Annual Revenue (45% × ₹1,80,000) (A)	81,000
Cost Saving in respect of Cartons [(2,500-1,200) × ₹55] (B)	71,500
Total Benefits (A+B)	1,52,500

As Expected Benefits are more than the cost. Accordingly company should install the new system.

(ii) Calculation of additional amount of revenue required if benefits from new system is equal to cost & Contribution margin is 47.5%:

	₹
Costs of the new scheduling & tracking system (A)	1,25,000
Cost Saving in respect of Cartons (B)	71,500
Contribution Margin (A – B)	53,500
Contribution Margin %	47.5
Corresponding Additional Revenue	1,12,632

6. JIT Inventory System

"For successful operation of JIT inventory system, the suppliers chosen must be willing to make frequent deliveries in small lots. Rather than deliver a week's or a month's material at one time, suppliers must be willing to make deliveries several times a day and in the exact quantities specified by the buyer."

It is described in the problem that suppliers are not willing to

- make frequent deliveries and
- make supplies in the exact quantities as required

Accordingly, Mr. Smith's doubt is correct on successful implementation of JIT System.

7. Limiting Factor

Case	Basis for Selecting Priority of Product
If maximum sales (in value) is a limiting factor	Profit Volume Ratio

If raw material is a limiting factor	Contribution per unit of raw material required to produce one unit of a product
If labour hour is a limiting factor	Contribution per unit of labour hour required to produce one unit of a product
If there is a heavy demand for the product	Profit Volume Ratio

8. (a) 1. Projected Raw Material Issues (Kg):

	'N'	'O'	'P'
'L' (48,000 units-Refer Note)	60,000	24,000	---
'M' (36,000 units-Refer Note)	72,000	-	54,000
Projected Raw Material Issues	1,32,000	24,000	54,000

Note:

- Based on this experience and the projected sales, the DTSML has budgeted production of 48,000 units of 'L' and 36,000 units of 'M' in the sixth period.

  = 52,500 x 40% + 45,000 – 18,000 = 48,000

  = 27,000 x 40% + 42,000 – 16,800 = 36,000

- Production is assumed to be uniform for both products within each four-week period.

2. and 3. Projected Inventory Activity and Ending Balance (Kg):

	'N'	**'O'**	**'P'**
Average Daily Usage	6,600	1,200	2,700
Beginning Inventory	96,000	54,000	84,000
Add: Orders Received:			
Ordered in 5th period	90,000	-	60,000
Ordered in 6th period	90,000	-	-
Sub Total	276,000	54,000	144,000
Less: Issues	132,000	24,000	54,000
Projected ending inventory balance	144,000	30,000	90,000

Note:

- Ordered 90,000 Kg of 'N' on fourth working day.
- Order for 90,000 Kg of 'N' ordered during fifth period received on tenth working day.

- Order for 90,000 Kg of 'N' ordered on fourth working day of sixth period received on fourteenth working day.
- Ordered 30,000 Kg of 'O' on eighth working day.
- Order for 60,000 Kg of 'P' ordered during fifth period received on fourth working day.
- No orders for 'P' would be placed during the sixth period.

4. Projected Payments for Raw Material Purchases:

Raw Material	Day/Period Ordered	Day/Period Received	Quantity Ordered	Amount Due (₹)	Day/Period Due
'N'	20th/5th	10th /6th	90,000 Kg	90,000	20th/6th
'P'	4th/5th	4th /6th	60,000 Kg	60,000	14th/6th
'N'	4th/6th	14th /6th	90,000 Kg	90,000	4th/7th
'O'	8th/6th	13th /7th	30,000 Kg	60,000	3rd/8th

9. Following acceptance by early innovators, conventional consumers start following

Situation		Appropriate Pricing Policy
(i)	'A' is a new product for the company and the market and meant for large scale production and long term survival in the market. Demand is expected to be elastic.	Penetration Pricing
(ii)	'B' is a new product for the company, but not for the market. B's success is crucial for the company's survival in the long term.	Market Price or Price Just Below Market Price
(iii)	'C' is a new product to the company and the market. It has an inelastic market. There needs to be an assured profit to cover high initial costs and the unusual sources of capital have uncertainties blocking them.	Skimming Pricing
(iv)	'D' is a perishable item, with more than 80% of its shelf life over.	Any Cash Realizable Value*

(*) this amount decreases every passing day.

10. (i) Total Direct Labour Cost for first 8 batches based on learning curve of 90% (when the direct labour cost for the first batch is ₹55,000)

The usual learning curve model is

$$y = ax^b$$

Where

y = Average Direct Labour Cost *per batch* for x batches
a = Direct Labour Cost for *first batch*
x = Cumulative No. of batches produced
b = Learning Coefficient /Index

$y = ₹\ 55,000 \times (8)^{-0.152}$

$= ₹\ 55,000 \times 0.729$

$= ₹\ 40,095$

Total Direct Labour Cost for first 8 batches

= 8 batches × ₹ 40,095

= **₹ 3,20,760**

Total Direct Labour Cost for first 7 batches based on learning curve of 90% (when the direct labour cost for the first batch is ₹ 55,000)

$y = ₹\ 55,000 \times (7)^{-0.152}$

$= ₹\ 55,000 \times 0.744$

= **₹ 40,920**

Total Direct Labour Cost for first 7 batches

= 7 batches × ₹ 40,920

= ₹ 2,86,440

Direct Labour Cost for 8th batch

= ₹ 3,20,760 – ₹ 2,86,440

= ₹ 34,320

(ii) Statement Showing "Life Time Expected Contribution"

Particulars	**Amount (₹)**
Sales (₹102 × 16,000 units)	16,32,000
Less: Direct Material and Other Non Labour Related Variable Costs (₹50 × 16,000 units)	8,00,000
Less: Direct Labour *	5,95,320
Expected Contribution	**2,36,680**

(*) Total Labour Cost over the Product's Life

= ₹3,20,760 + (8 batches × ₹34,320)

= ₹5,95,320

(iii) In order to achieve a Profit of ₹5,00,00,000 the Total Direct Labour Cost over the Product's Lifetime would have to equal ₹3,32,000.

Statement Showing "Life Time Direct Labour Cost"

Particulars	Amount (₹)
Sales (₹102 × 16,000 units)	16,32,000
Less: Direct Material and Other Non Labour Related Variable Costs (₹50 × 16,000 units)	8,00,000
Less: Desired Life Time Contribution	5,00,000
Direct Labour	**3,32,000**

Average Direct Labour Cost *per batch* for 16 batches is ₹20,750 (₹3,32,000 / 16 batches).

Total Direct Labour Cost for 16 batches based on learning curve of r% (when the direct labour cost for the first batch is ₹ 55,000)

$y = ₹\ 55,000 \times (16)^b$

$₹\ 20,750 = ₹\ 55,000 \times (16)^b$

$0.3773 = (16)^b$

$\log 0.3773 = b \times \log 2^4$

$\log 0.3773 = b \times 4 \log 2$

$\log 0.3773 = \left(\frac{\log r}{\log 2}\right) \times 4 \log 2$

$\log 0.3773 = \log r^4$

$0.3773 = r^4$

$r = \sqrt[4]{0.3773}$

r = 78.37%

11. (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.

12. Primal

Minimize

$$Z = 2x_1 - 3x_2 + 4x_3$$

Subject to the Constraints

$$\begin{aligned} 3x_1 + 2x_2 + 4x_3 &\geq 9 \\ 2x_1 + 3x_2 + 2x_3 &\geq 5 \\ -7x_1 + 2x_2 + 4x_3 &\geq -10 \\ 6x_1 - 3x_2 + 4x_3 &\geq 4 \\ 2x_1 + 5x_2 - 3x_3 &\geq 3 \\ -2x_1 - 5x_2 + 3x_3 &\geq -3 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

Dual:

Maximize

$$Z = 9y_1 + 5y_2 - 10y_3 + 4y_4 + 3y_5 - 3y_6$$

Subject to the Constraints:

$$3y_1 + 2y_2 - 7y_3 + 6y_4 + 2y_5 - 2y_6 \leq 2$$

$$2y_1 + 3y_2 + 2y_3 - 3y_4 + 5y_5 - 5y_6 \leq -3$$

$$4y_1 + 2y_2 + 4y_3 + 4y_4 - 3y_5 + 3y_6 \leq 4$$

$$y_1, y_2, y_3, y_4, y_5, y_6 \geq 0$$

By substituting $y_5 - y_6 = y_7$ the dual can alternatively be expressed as:

Maximize

$Z =$

$9y_1 + 5y_2 - 10y_3 + 4y_4 + 3y_7$

Subject to the Constraints:

$3y_1 + 2y_2 - 7y_3 + 6y_4 + 2y_7 \leq 2$

$-2y_1 - 3y_2 - 2y_3 + 3y_4 - 5y_7 \geq 3$

$4y_1 + 2y_2 + 4y_3 + 4y_4 - 3y_7 \leq 4$

$y_1, y_2, y_3, y_4 \geq 0$, y_7 *unrestricted in sign.*

13. Relevant / Not Relevant

S. No.	Name of the Cost	Example	Relevant / Not Relevant
(i)	Sunk Cost	Written down value of machine already purchased.	Not Relevant in decision making.
(ii)	Opportunity Cost	Funds invested in business or deposited into bank.	Useful in decision making.
(iii)	Out of Pocket Cost	Commission to salesman on sales, Carriage inward.	Relevant for decision making.
(iv)	Differential Cost	Include all fixed and variable cost which are increased /decreased.	Relevant in specific decision making.
(v)	Notional Cost	Notional Rent for use of space.	Relevant, if company benefit by using resource alternatively.

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