

PAPER – 5 : COST MANAGEMENT

Question No. 1 is compulsory.
Answer any **four** questions from the rest.

Question 1

- (a) What do you mean by 'Back flushing' in JIT system ? Explain briefly the problems with back flushing that must be corrected before it will work properly. (4 marks)
- (b) Explain Skimming pricing strategy. (4 marks)
- (c) Panchwati Cement Ltd. produces '43 grade' cement for which the company has an assured market. The output for 2004 has been budgeted at 1,80,000 units at 90% capacity utilisation. The cost sheet based on output (per unit) is as follows:

	Rs.
Selling price	130
Direct material	30
Component 'EH'	9.40
Direct wages @ Rs. 7 per hour	28
Factory overhead (50% fixed)	24
Selling and distribution overheads (75% variable)	16
Administrative overhead (fixed)	5

The factory overheads are applied on the basis of direct labour hours.

To utilise the idle capacity and to improve the profitability of the company, the following proposals were put up before the Board of Directors for consideration:

- (i) An order has been received from abroad for 500 units of product '53 grade' cement per month at Rs. 175 per unit. The cost data are:
- Direct material Rs. 56 per unit, direct labour 10 hours per unit, selling and distribution overhead applicable to this product order is Rs. 14 per unit and variable factory overhead are chargeable on the basis of direct labour hours.
- (ii) The company at present manufactures component 'EH', one unit of which is required for each unit of product '43 grade'. The cost details for 15,000 units of component 'EH' are as follows:

	Rs.
Direct materials	30,000
Direct labour	52,500
Variable overheads	25,500
Fixed overheads	33,000
Total	1,41,000

The component 'EH' however is available for purchase at the market at Rs. 7.90 per unit.

- (iii) In the event of company deciding to purchase the component 'EH' from market, the company has two alternatives for the use of the capacity so released, which are as under:

- (a) Rent out the released capacity at Re. 1 per hour.
- (b) Manufacture component 'GYP' which can be sold at Rs. 8 per unit. The cost data of this component for 15,000 units are:

	Rs.
Direct materials	42,000
Direct labour	31,500
Factory variable overheads	13,500
Other variable overheads	25,500
Total	1,12,500

Required:

- (i) Prepare a statement showing profitability of the company envisaged in the budget.
- (ii) Evaluate the export order and state whether it is acceptable or not.
- (iii) Make an appraisal of proposal to manufacture component 'EH' and state whether the component 'EH' should be manufactured in the factory or purchased from the market. Assume that no alternative use of spare capacity is available.
- (iv) Evaluate the alternative use of the spare capacity and state whether to manufacture or buy the component 'EH' and if your decision is to buy the component 'EH', which of the two alternatives for the use of spare capacity will you prefer ? (16 marks)

Answer

(a) Back flushing in a JIT system

Traditional accounting systems record the flow of inventory through elaborate accounting procedures. Such systems are required in those manufacturing environment where inventory/WIP values are large. However, since JIT systems operate in modern manufacturing environment characterized by low inventory and WIP values, usually also

associated with low cost variances, the requirements of such elaborate accounting procedures does not exist.

Back flushing requires no data entry of any kind until a finished product is completed. At that time the total amount finished is entered into the computer system which is multiplied by all components as per the Bill of materials (BOM) for each item produced. This yields a lengthy list of components that should have been used in the production process and this is subtracted from the opening stock to arrive at the closing stock to arrive at the closing stock/inventory.

The problems with back flushing that must be corrected before it works properly are:

- (i) The total production quantity entered into the system must be absolutely correct, if not, then wrong components and quantities will be subtracted from the stock.
- (ii) All abnormal scrap must be diligently tracked and recorded. Otherwise materials will fall outside the back flushing system and will not be charged to inventory.
- (iii) Lot tracing is impossible under the back flushing system. This is required when a manufacturer needs to keep records of which production lots were used to create a product in case all the items in a lot need be recalled.
- (iv) The inventory balance may be too high at all times because the back flushing transaction that relieves inventory usually does so only once a day, during which time other inventory is sent to the production process. This makes it difficult to maintain an accurate set of inventory records in the warehouse.

(b) Skimming pricing

It is a policy where the prices are kept high during the early period of a product's existence. This can be synchronised with high promotional expenditure and in the latter years the prices can be gradually reduced. The reasons for following such a policy are as follows:

- (i) The demand is likely to be inelastic in the earlier stages till the product is established in the market.
- (ii) The gradual reduction in price in the latter years will tend to increase the sales.
- (iii) This method is preferred in the beginning because in the initial periods when the demand for the product is not known the price covers the initial cost of production.
- (iv) High initial capital outlays needed for manufacture, results in high cost of production. In addition to this, the producer has to incur huge promotional activities resulting in increased costs. High initial prices will be able to finance the cost of production particularly when uncertainties block the usual sources of capital.

(c) (i) Profitability as per original Budget

		<i>Rs ('000s)</i>	<i>Rs('000s)</i>
Sales(1,80,000 units × Rs 130)	(A)		23,400
Direct Material (1,80,000 units × Rs 30)		5,400	

Component 'EH' (variable cost = Rs 7.20 per unit)		1,296
Direct wages (1,80,000 units × Rs 28)		5,040
Variable factory overheads (1,80,000 units × Rs 24 × 50%)		2,160
Variable selling & distribution (1,80,000 units × Rs 16 × 75%)		2,160
Total variable cost	(B)	16,056
Contribution	(A – B)	7,344
Fixed factory overheads		2,160
Fixed selling & distribution overheads		720
Component 'EH' @2.20(Fixed cost per unit)		396
Fixed administrative overhead		900
Profit		3,168

(ii)

Export order

	<i>Rs per Unit</i>	<i>Rs per Unit</i>
Direct material	56	
Direct labour (10 hours × Rs 7 per hour)	70	
Variable factory overhead (Rs 3 × 10 labour hours)	30	
Selling and distribution overheads	14	
Total variable cost		170
Selling price (export)		175
Contribution		5

Since the product earns contribution of Rs.5 per unit, it should be accepted.

Total units 500(per month) = 6000 units(per annum)

Therefore additional contribution (6000 units × Rs 5) = Rs.30,000

Total hours on product '43 grade' (1,80,000 units × 4) = 7,20,000 Hrs

Total hours on component 'EH' (1,80,000 units × 0.5*) = 90,000 Hrs

$$* \frac{\text{Direct Labour cost}}{\text{No of units produced} \times \text{Labour rate per hour}} = \frac{\text{Rs } 52,500}{15,000 \text{ units} \times \text{Rs } 7 \text{ per hour}} = 0.5 \text{ Hrs}$$

Total hours utilised at 90% capacity = 7,20,000 hours + 90,000 hours = 8,10,000 hours

$$100\% \text{ capacity hours} = \frac{8,10,000 \text{ hours} \times 100}{90} = 9,00,000 \text{ Hrs}$$

Balance hours available = 90,000 hours p.a

Hours required for export order 60,000 hours.

Both contribution per unit of export order and availability of capacity confirm its acceptance.

(iii) Component 'EH' make or buy

(Per 15,000 units)	Make (Rs.)	Buy (Rs.)
Direct material	30,000	
Direct labour	52,500	
Variable factory overhead	25,500	
Total	1,08,000	1,18,500
Per unit	7.20	7.90

If the company makes the component the out of pocket cost is Rs.7.20 per unit whereas if the component is bought , the out of pocket cost is Rs.7.90.

Decision : If the capacity remains idle it is profitable to make.

(iv) Alternative use of the spare capacity

Units required = 1,80,000 units and hours required = $1,80,000 \times 0.5 = 90,000$ Hrs

Cost of buying component 'EH' = $(1,80,000 \text{ units} \times \text{Rs } 7.90) = \text{Rs } 14,22,000$

Cost of making component 'EH' = $(1,80,000 \text{ units} \times \text{Rs } 7.20) = \text{Rs } 12,96,000$

Hence , excess cost of buying = Rs.1,26,000

Rent income $(90,000 \text{ hours} \times \text{Rs } 1) = \text{Rs } 90,000$

Contribution per unit from making component 'GYP' = $\text{Rs } 8 - \frac{\text{Rs } 1,12,500}{15,000 \text{ Units}} = \text{Rs } 0.5$ per unit.

Direct labour cost per unit of 'GYP' = $\frac{\text{Rs } 31,500}{15,000 \text{ Units}} = \text{Rs } 2.10$ per unit.

No. of labour hours required for one unit of 'GYP' = $\frac{\text{Rs } 2.10}{\text{Rs } 7} = 0.3$ Hrs

No. of units of 'GYP' in 90,000 hours = $\frac{90,000 \text{ hours}}{0.3 \text{ hours}} = 3,00,000$

Contribution from component 'GYP' = $3,00,000 \times \text{Rs } 0.50 = \text{Rs } 1,50,000$

Since the contribution from 'GYP' is greater than the extra variable cost of buying component 'EH' , component 'GYP' should be manufactured and component 'EH' should be purchased.

Question 2

- (a) What are the advantages and limitations of Zero base Budgeting ? (4 marks)
- (b) What are benchmarking code of conduct? (3 marks)
- (c) Explain briefly the main features of ERP. (4 marks)
- (d) A Company manufactures two Products A and B by making use of two types of materials, viz., X and Y. Product A requires 10 units of X and 3 units of Y. Product B requires 5 units of X and 2 units of Y. The price of X is Rs. 2 per unit and that of Y is Rs. 3 per unit. Standard hours allowed per product are 4 and 3, respectively. Budgeted wages rate is Rs. 8 per hour. Overtime premium is 50% and is payable, if a worker works for more than 40 hours a week. There are 150 workers.

The Sales Manager has estimated the sales of Product A to be 5,000 units and Product B 10,000 units. The target productivity ratio (or efficiency ratio) for the productive hours worked by the direct worker in actually manufacturing the product is 80%, in addition, the non-productive downtime is budgeted at 20% of the productive hours worked. There are twelve 5-day weeks in the budget period and it is anticipated that sales and production will occur evenly throughout the whole period.

It is anticipated that stock at the beginning of the period will be:

Product A 800 units; Product B 1,680 units. The targeted closing stock expressed in terms of anticipated activity during the budget period are Product A 12 days sales; Product B 18 days sales. The opening and closing stock of raw material of X and Y will be maintained according to requirement of stock position for Product A and B.

You are required to prepare the following for the next period:

- (i) Material usage and Material purchase budget in terms of quantities and values.
- (ii) Production budget.
- (iii) Wages budget for the direct workers. (8 marks)

Answer**(a) Advantages of ZBB**

- (i) It provides a systematic approach for evaluation of different activities and ranks them in order of preference for allocation of scarce resources.
- (ii) It ensures that the various functions undertaken by the organisation are critical for the achievement of its objectives and are being performed in the best way.
- (iii) It provides an opportunity to the management to allocate resources for various activities only after having a thorough cost-benefit analysis.
- (iv) The area of wasteful expenditure can be easily identified and eliminated.
- (v) Departmental budgets are closely linked with corporate objectives.

- (vi) The technique can also be used for the introduction and implementation of the system of 'management by objective'.

Limitations of ZBB

- (i) Various operational problems are likely to be faced in implementing the technique.
- (ii) The full support of top management is required.
- (iii) It is time consuming as well as costly.
- (iv) It requires proper trained managerial staff.

(b) Benchmarking code of conduct

Benchmarking is the process of identifying and learning from the best practices anywhere in the world. It is a powerful tool for continuous improvement. To contribute to efficient, effective and ethical benchmarking, individuals agree for themselves and their organisation to be abided by the following principles for the benchmarking with other organisations.

Suggested benchmarking code of conduct:

- (i) Principle of legality
- (ii) Principle of exchange
- (iii) Principle of confidentiality
- (iv) Principle of use
- (v) Principle of first party contact
- (vi) Principle of third party contact
- (vii) Principle of preparation

(c) Features of ERP

- It facilitates company wide integrated information systems covering all functional areas like manufacturing, purchase, payables, inventory etc.
- It performs core activities and increases customer services thereby projecting and enhancing the corporate image.
- It bridges the information gap across organisations.
- It offers a solution to better project management.
- It allows automatic introduction of the latest technologies like Electronic Fund Transfer, Internet, Video Conferencing etc.
- It eliminates business problems like shortage of material, inventory problems etc.
- It provides for improving and refining the business process.
- It provides complete integration of systems, not only across departments, but also across the companies under same management.

(d) (i)

Material usage budget

	<i>Product A (units)</i>	<i>Product B (units)</i>	<i>Total material usage units</i>	<i>Cost per unit (Rs)</i>	<i>Total cost of materials (Rs)</i>
Estimated sales	5,000	10,000			
Material X : 10 units per product A and 5 units per product B	50,000	50,000	1,00,000	2	2,00,000
Material Y : 3 units per product A and 2 units per product B	15,000	20,000	35,000	3	1,05,000
Total	65,000	70,000	1,35,000		3,05,000

Material Purchase Budget

	<i>X Units</i>	<i>Y Units</i>	<i>Total</i>
Required for sales	1,00,000	35,000	
Add: desired closing stock			
Product A:			
1,000 units (A) $\times$ 10 units (X) = 10,000 units of X			
3,000 units (B) $\times$ 5 units (X) = 15,000 units of X.	25,000		
Product B:			
1,000 units (A) $\times$ 3 units (Y) = 3000 units of Y			
3,000 units (B) $\times$ 2 units (Y) = 6,000 units of Y.		9,000	
	1,25,000	44,000	
Less: Opening stock			
Product A:			
800 units (A) $\times$ 10 units (X) = 8,000 units of X			
1,680 units (B) $\times$ 5 units (X) = 8,400 units of X	16,400		
Product B			
800 units (A) $\times$ 3 units (Y) = 2,400 units of Y			
1,680 units (B) $\times$ 2 units (Y) = 3,360 units of Y.		5,760	
Units to be purchased	1,08,600	38,240	1,46,840
Cost per unit	Rs.2	Rs.3	
Cost of purchase (Rs.)	2,17,200	1,14,720	3,31,920

(ii)

Production Budget

	<i>Product A</i>	<i>Product B</i>
	<i>Units</i>	<i>Units</i>
Sales	5,000	10,000
Add: Closing stock**	1,000	3,000
	6,000	13,000
Less: Opening stock	800	1,680
Production	5,200	11,320

**Calculation of closing stock:

Budgeted period is 12 weeks of 5 days each =60 days.

$$\text{Product A} = \frac{5,000 \times 12}{60} = 1,000 \text{ units}$$

$$\text{Product B} = \frac{10,000 \times 18}{60} = 3,000 \text{ units}$$

(iii)

Wages budget for direct workers

	<i>Product A</i> (hrs)	<i>Product B</i> (hrs)	<i>Total</i> (hrs.)
Standard hours (budgeted)			
5,200 units (A) × 4 hours per unit and 11,320 units (B) × 3 hours per unit.	20,800	33,960	54,760
Standard hours at 80% efficiency ratio			68,450
Add: non productive time (20% of 68,450)			13,690
			82,140
Labour hours required (150 workers × 8 hours per day × 60 days)			72,000
Overtime			10,140

Wages for normal hours (72,000 × 8) = Rs 5,76,000

Wages for overtime (10,140 × 8 × 1.5) = Rs 1,21,680

Total wages = Rs 6,97,680

Question 3

- (a) XYZ Ltd. manufactures four products, namely A, B, C and D using the same plant and process. The following information relates to a production period: (11 marks)

Product	A	B	C	D
Output in units	720	600	480	504
Cost per unit:	Rs.	Rs.	Rs.	Rs.
Direct Material	42	45	40	48
Direct labour	10	9	7	8
Machine hours per unit	4 hrs.	3 hrs.	2 hrs.	1 hr.

The four products are similar and are usually produced in production runs of 24 units and sold in batches of 12 units. Using machine hour rate currently absorbs the production overheads. The total overheads incurred by the company for the period is as follows:

	Rs.
Machine operation and Maintenance cost	63,000
Setup costs	20,000
Store receiving	15,000
Inspection	10,000
Material handling and dispatch	2,592

During the period the following cost drivers are to be used for the overhead cost:

Cost	Cost driver
Setup cost	No. of production runs
Store receiving	Requisition raised
Inspection	No. of production runs
Material handling and dispatch	Orders executed

It is also determined that:

- Machine operation and maintenance cost should be apportioned between setup cost, store receiving and inspection activity in 4:3:2.
- Number of requisition raised on store is 50 for each product and the no. of order executed is 192, each order being for a batch of 12 of a product.

Required:

- (i) Calculate the total cost of each product, if all overhead costs are absorbed on machine hour rate basis.
 - (ii) Calculate the total cost of each product using activity base costing.
 - (iii) Comment briefly on differences disclosed between overheads traced by present system and those traced by activity base costing. (11 marks)
- (b) A manufacturing company produces two types of product the SUPER and REGULAR. Resource requirements for production are given below in the table. There are 1,600 hours of assembly worker hours available per week. 700 hours of paint time and 300 hours of inspection time. Regular customers bill demand at least 150 units of the REGULAR type and 90 units of the SUPER type. (8 marks)

Table				
Product	Profit/contribution Rs.	Assembly time Hrs.	Paint time Hrs.	Inspection time Hrs.
REGULAR	50	1.2	0.8	0.2
SUPER	75	1.6	0.9	0.2

Formulate and solve the given Linear programming problem to determine product mix on a weekly basis.

Answer

(a) (i) Total cost of different products (overhead absorption on Machine hour basis)

	A	B	C	D
	Rs.	Rs.	Rs.	Rs.
Direct material	42	45	40	48
Direct labour	10	09	07	08
Overhead	72	54	36	18
Cost of production per unit	124	108	83	74
Out put in unit	720	600	480	504
Total cost	89,280	64,800	39,840	37,296

Machine hours $(720 \times 4 + 600 \times 3 + 480 \times 2 + 504 \times 1) = 6,144$ hours.

Rate per hour = $\frac{\text{Rs } 1,10,592}{6,144 \text{ hours}} = \text{Rs } 18 \text{ per hour.}$

(ii) Activity based costing system

	<i>Set up</i>	<i>Store receiving</i>	<i>Inspection</i>
Machine operation and maintenance cost of Rs 63,000 to be distributed in the ratio of 4: 3: 2.	28,000	21,000	14,000

<i>Cost</i>	<i>Rs</i>	<i>Drivers</i>	<i>No</i>	<i>Cost per unit of driver (Rs)</i>
Set up	48,000	Production runs	96	500
Store receiving	36,000	Requisitions raised	200	180
Inspection	24,000	Production runs	96	250
Material handling and disp	2,592	Orders	192	13.50

Production Run for A (720/24) = 30 ; B (600/24) = 25 ; C (480/24) = 20 ; D (504/24) = 21.

	<i>A (Rs)</i>	<i>B (Rs)</i>	<i>C (Rs)</i>	<i>D (Rs)</i>
Direct material	30,240	27,000	19,200	24,192
Direct labour	7,200	5,400	3,360	4,032
Setup	15,000	12,500	10,000	10,500
Store receiving	9,000	9,000	9,000	9,000
Inspection	7,500	6,250	5,000	5,250
Material handling and dispatch	810	675	540	567
Total cost	69,750	60,825	47,100	53,541
Per unit cost	96.875	101.375	98.125	106.23

(iii)

	<i>A (Rs.)</i>	<i>B (Rs.)</i>	<i>C (Rs.)</i>	<i>D (Rs.)</i>
Cost per unit (a)	124	108	83	74
Cost per unit (b)	96.88	101.38	98.13	106.23
Difference	(27.12)	(6.62)	15.13	32.23

The total overheads which are spread over the four products have been apportioned on different bases, causing the product cost to differ substantially in respect of product A

and D. A change from traditional machine hour rate to an activity system may have effect on price and profits to the extent that pricing is based on cost plus approach.

- (b) Let x_1 and x_2 denote the number of units produced per week of the product 'REGULAR' and 'SUPER' respectively.

$$\text{Maximise } Z = 50x_1 + 75x_2$$

Subject to

$$1.2x_1 + 1.6x_2 \leq 1,600 \text{ or } 12x_1 + 16x_2 \leq 16,000 \quad \text{-(i)}$$

$$0.8x_1 + 0.9x_2 \leq 700 \text{ or } 8x_1 + 9x_2 \leq 7,000 \quad \text{-(ii)}$$

$$0.2x_1 + 0.2x_2 \leq 300 \text{ or } 2x_1 + 2x_2 \leq 3,000 \quad \text{-(iii)}$$

$$x_1 \leq 150 \quad \text{-(iv)}$$

$$x_2 \leq 90 \quad \text{-(v)}$$

Let

$$x_1 = y_1 + 150$$

$$x_2 = y_2 + 90 \text{ where } y_1, y_2 \geq 0$$

$$\text{Maximize } Z = 50(y_1 + 150) + 75(y_2 + 90) \text{ or } Z = 50y_1 + 75y_2 + 14,250$$

Subject to :

$$12(y_1 + 150) + 16(y_2 + 90) \leq 16,000$$

$$8(y_1 + 150) + 9(y_2 + 90) \leq 7,000$$

$$2(y_1 + 150) + 2(y_2 + 90) \leq 3,000$$

$$\text{and } y_1, y_2 \geq 0$$

Adding slack variables s_1, s_2, s_3 , we get

$$\text{Maximize } Z = 50y_1 + 75y_2 + 14,250 \text{ subject to}$$

$$12y_1 + 16y_2 + s_1 = 12,760$$

$$8y_1 + 9y_2 + s_2 = 4,990$$

$$2y_1 + 2y_2 + s_3 = 2,520$$

Table -1

C_j			50	75	0	0	0	
C_b			y_1	y_2	s_1	s_2	s_3	
0	s_1	12,760	12	16	1	0	0	12760/16
0	s_2	4,990	8	9	0	1	0	4990/9
0	s_3	2,520	2	2	0	0	1	2520/2
$\uparrow$			-50	-75	0	0	0	

Table II

C_j			50	75	0	0	0
C_b			y_1	y_2	s_1	s_2	s_3
0	s_1	3889	-20/9	0	1	-16/9	0
75	y_2	554.44	8/9	1	0	1/9	0
0	s_3	1411	2/9	0	0	-2/9	1
$\uparrow$			50/3	0	0	75/9	0

Since all the elements in the index row are either positive or equal to zero , table II gives an optimum solution which is $y_1 = 0$ and $y_2 = 554.44$

Substituting these values we get

$$x_1 = 150$$

$$x_2 = 644.44 \text{ and the value of objective function is}$$

$$Z = 50 \times 150 + 75 \times 644.44$$

$$= \text{Rs. } 55,833$$

Question 4

- (a) "Relevant cost analysis helps in drawing attention of managers to those elements of costs, which are relevant for the decision." Comment . (5 marks)
- (b) A company manufactures two products X and Y. Product X requires 8 hours to produce while Y requires 12 hours. In April, 2004, of 22 effective working days of 8 hours a day, 1,200 units of X and 800 units of Y were produced. The company employs 100 workers in production department to produce X and Y. The budgeted hours are 1,86,000 for the year.

Calculate Capacity, Activity and Efficiency ratio and establish their relationship.

(6 marks)

- (c) *A manufacturing company runs its boiler on furnace oil obtained from X oil company and Y oil company whose depots are situated at a distance of 24 kms and 16 kms from the factory site.*

Transportation of furnace oil is made by company's own tank lorries (two) of 8 ton capacity each. Onward trips are made only with full load and the lorries return empty. The filling time takes an average of 40 minutes for X oil company and 30 minutes for Y oil company. The empty time in the factory is only 40 minutes for each. The average speed of lorries work out is 24 kms per hour. The varying operating charges average 80 paise per km covered and fixed charges gives an incidence of Rs. 7.50 per hour of operation.

Calculate the transportation cost per ton-km for each source of furnace oil. (8 marks)

Answer

- (a) Business decision involves planning for the future and requires consideration of several alternative choices. In making such decisions estimates of future costs and revenues are worked out. The costs that matter in business decisions are only future costs. Actual or current or historical costs may only be used for estimating future costs of the alternative choices but decision making would only require consideration of future costs which are pertinent to such decisions. Relevant costs are therefore such costs which will influence the decision and are directly related to the decision to be made. For example, in a machinery replacement decision, the original cost and the present depreciated book value of the old plants are not relevant. The expected sales value of the old plant is relevant because it will reduce the amount of investment in the new plant.

Some important points are –

- (i) Historical costs being sunk cost are not relevant to the decision.
- (ii) Even among future costs, those variable costs which do not differ under various alternatives are not relevant.
- (iii) If fixed expenses remain unchanged under different alternatives such expenses are not relevant to the decision.
- (iv) Book value of the equipment is not relevant because it is past cost.

Thus only such costs which are capable of making a difference in use decisions and enter into a choice between alternative courses of action are relevant.

(b) Standard hours produced

	<i>Product X</i>	<i>Product Y</i>	<i>Total</i>
Out put (units)	1,200	800	
Hours per unit	8	12	
Standard hours	9,600	9,600	19,200
<i>Actual hours worked</i>			
100 workers × 8 hours × 22 days =			17,600
<i>Budgeted hours per month</i>			
1,86,000/12 =			15,500

$$\text{Capacity Ratio} = \frac{\text{Actual hours}}{\text{Budgeted hours}} \times 100 = \frac{17,600}{15,500} \times 100 = 113.55\%$$

$$\text{Efficiency Ratio} = \frac{\text{Std. Hours produced}}{\text{Actual hours}} \times 100 = \frac{19,200}{17,600} \times 100 = 109.09\%$$

$$\text{Activity Ratio} = \frac{\text{Std. hour produced}}{\text{Budget . hours}} \times 100 = \frac{19,200}{15,500} \times 100 = 123.87\%$$

Relationship : Activity ratio = Efficiency ratio × Capacity ratio

$$\text{or } 123.87 = \frac{109.09 \times 113.55}{100}$$

(c) Calculation of variable cost

	<u>Distance</u> <i>X</i>	<u>Distance</u> <i>Y</i>
One side distance	24 km	16 km
Round trip	48 km	32 km
Variable cost @ .80 per km	Rs.38.40	Rs.25.60

Calculation of fixed cost

	<u>Distance</u> <i>X</i>	<u>Distance</u> <i>Y</i>
Actual running time for round trip distance at the speed of 24 km per hour	120 Min	80 Min
Filling time	40 Min	30 Min

Empty time	40 Min	40 Min
Total time	200 Min	150 Min
Fixed cost @ Rs 7.50 per hour	Rs.25	18.75
<i>Calculation of ton km</i>		
Capacity	8 tons	8 tons
Full load	24 km	16 km
Tons km	192	128

$$\text{Cost per ton km} = \frac{38.40 + 25}{192} = \text{Rs.0.33} \quad \frac{25.60 + 18.75}{128} = \text{Rs 0.347}$$

Question 5

- (a) Tycon Ltd. has two manufacturing departments organised into separate profit centres known as Textile unit and Process House. The Textile unit has a production capacity of 5 lacs metres cloth per month, but at present its sales is limited to 50% to outside market and 30% to process house.

The transfer price for the year 2004 was agreed at Rs.6 per metre. This price has been fixed in line with the external wholesale trade price on 1st January, 2004. However, the price of yarn declined, which was the raw material of textile unit, with effect, that wholesale trade price reduced to Rs. 5.60 per metre with effect from 1st June, 2004. This price was however not made applicable to the sales made to the processing house of the company. The textile unit turned down the processing house request for revision of price.

The Process house refines the cloth and packs the output known as brand Rayon in bundles of 100 metres each. The selling price of the Rayon is Rs. 825 per bundle. The process house has a potential of selling a further quantity of 1,000 bundles of Rayon provided the overall prices is reduced to Rs. 725 per bundle. In that event it can buy the additional 1,00,000 metres of cloth from textile unit, whose capacity can be fully utilised. The outside market has no further scope.

The cost data relevant to the operations are:

	Textile unit Rs.	Process house Rs.
Raw material (per metre)		
on 1 st June, 2004	3.00	Transfer price
Variable cost	1.20 (per metre)	80 (per bundle)
Fixed cost (per month)	4,12,000	1,00,000

You are required to:

- (i) *Prepare statement showing the estimated profitability for June, 2004 for Textile unit and Process house and company as a whole on the following basis:*
 - (a) *At 80% and 100% capacity utilisation of the Textile unit at the market price and the transfer price to the Processing house of Rs. 6 per metre.*
 - (b) *At 80% capacity utilisation of the Textile unit at the market price of Rs. 5.60 per metre and the transfer price to the Processing house of Rs. 6 per metre.*
 - (c) *At 100% capacity utilisation of the Textile unit at the market price of Rs. 5.60 per metre and the transfer price to the Processing house of Rs. 5.60 per metre.*
- (ii) *Comment on the effect of the company's transfer pricing policy on the profitability of Processing house.* (11 marks)
- (b) *Given the following project network, determine:* (8 marks)
 - (i) *Earliest expected completion time for each event*
 - (ii) *Latest allowable completion time for each event*
 - (iii) *Slack time for each event*
 - (iv) *The critical path*
 - (v) *The probability that the project will be completed on schedule, if the scheduled completion time is 38.*

Project Diagram

Answer**(a) (1) (a) At 80% level (in Rs)**

<i>-Textile unit</i>		<i>-Process house</i>	
Sales (4,00,000 × 6)	24,00,000	Sales (1,50,000/100) × 825	12,37,500
<i>Less</i>		<i>Less</i>	
Raw material (4,00,000 × 3)	12,00,000	Transfer Price (1,50,000 × 6)	9,00,000
Variable cost (4,00,000 × 1.2)	4,80,000	Variable cost (1,500 × 80)	1,20,000
Fixed cost	4,12,000	Fixed cost	1,00,000
Profit	3,08,000	Profit	1,17,500

Overall profit = 3,08,000 + 1,17,500 = Rs 4,25,500

At 100% level

Sales (5,00,000 × 6)	30,00,000	Sales (2,50,000/100) × 725	18,12,500
<i>Less</i>		<i>Less</i>	
Raw material (5,00,000 × 3)	15,00,000	Transfer Price (2,50,000 × 6)	15,00,000
Variable cost (5,00,000 × 1.2)	6,00,000	Variable cost	2,00,000
Fixed cost	4,12,000	Fixed cost	1,00,000
Profit	4,88,000	Profit	12,500

Overall profit = 4,88,000 + 12,500 = Rs 5,00,500

(b) At 80% level (market price 5.60 and transfer price 6/-) (in Rs)

<i>Textile unit</i>		<i>Process house</i>	
Sale (2,50,000 × 5.6)	1400000		
(1,50,000 × 6.0)	900000		
	23,00,000		
<i>Less</i>			
Raw material (4,00,000 × 3)	12,00,000		
Variable cost (4,00,000 × 1.2)	4,80,000		
Fixed cost	4,12,000		
Profit	2,08,000	Profit [As in (a) above.]	1,17,500

Overall profit = 2,08,000 + 1,17,500 = Rs 3,25,500

(c) At 100% level at market price and transfer price (5.60) (in Rs)

Sale (5,00,000 × 5.6)	28,00,000	Sales (2,50,000/100 × 725)	18,12,500
Less		Less	
Raw material (5,00,000 × 3)	15,00,000	Transfer Price (2,50,000 × 5.6)	14,00,000
Variable cost (5,00,000 × 1.20)	6,00,000	Variable cost (2,500 × 80)	2,00,000
Fixed cost	4,12,000	Fixed cost	1,00,000
Profit	2,88,000	Profit	1,12,500

Overall profit = 2,88,000 + 1,12,500 = 4,00,500

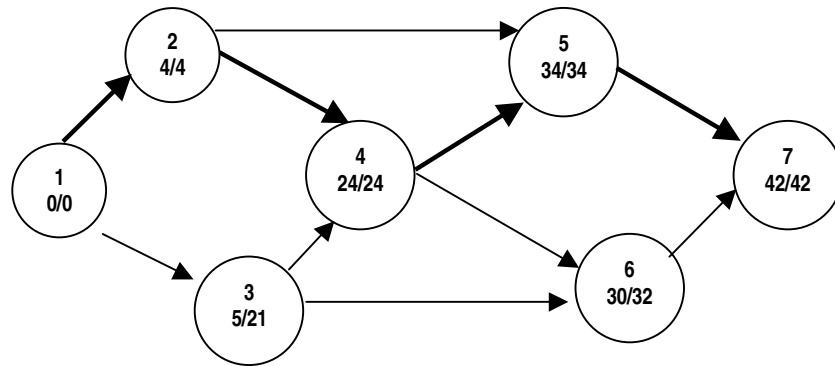
(ii) Comments on the profitability of processing house:-

		Transfer price (Rs)	Profit (Rs)
(a)	80% capacity	6.00	1,17,500
	100% capacity	6.00	12,500
(b)	80% capacity	6.00	1,17,500
(c)	100% capacity	5.60	1,12,500

Processing house will not be interested to buy more than 1,50,000 meters from textile unit.

(b) The earliest expected completion time, latest allowable completion time and slack time for each event is:-

Event (i-j)	σ^2	t_e	Earliest start	Earliest finish	Latest start	Latest finish	Slack
1-2	2	4	0	04	0	4	0
1-3	3	5	0	5	16	21	16
2-4	01	20	4	24	4	24	0
2-5	10	20	4	24	14	34	10
3-4	2	3	5	08	21	24	16
3-6	4	8	5	13	24	32	19
4-5	4	10	24	34	24	34	0
4-6	2	6	24	30	26	32	2
5-7	1	8	34	42	34	42	0
6-7	8	10	30	40	32	42	2



The critical path is 1-2-4-5-7 = 42

Variance of project time $\sigma^2 = 2+1+4+1 = 8$

Therefore, $\sigma = \sqrt{8}$ and scheduled time $T_s = 38$

$$Z = \frac{38 - 42}{\sqrt{8}} = \frac{-4}{\sqrt{8}} = -1.41$$

From table on normal curve, the area of $Z = 1.41$ is given as 0.4207

Therefore the probability of completion of the project by the scheduled time = $(0.50 - 0.4207) = 7.93\%$

Question 6

- (a) What is Product Life-cycle Costing? Describe its characteristics and benefits. (5 marks)
- (b) A Marketing Manager has 4 subordinates and 4 tasks. The subordinates differ in efficiency. The tasks also differ in their intrinsic difficulty. His estimates of the time each subordinate would take to perform each task is given in the matrix below. How should the task be allocated one to one man so that the total man-hours are minimised?

(7 marks)

	I	II	III	IV
1	16	52	34	22
2	26	56	8	52
3	76	38	36	30
4	38	52	48	20

- (c) A company trading in motor vehicle spares wishes to determine the level of stock it should carry for the item in its range. Demand is not certain and replenishment of stock takes 3 days. For one item X, the following information is obtained: (7 marks)

Demand (unit per day)	Probability
1	.1
2	.2
3	.3
4	.3
5	.1

Each time an order is placed, the company incurs an ordering cost of Rs. 20 per order. The company also incurs carrying cost of Rs. 2.50 per unit per day. The inventory carrying cost is calculated on the basis of average stock.

The manager of the company wishes to compare two options for his inventory decision.

- A. Order 12 units when the inventory at the beginning of the day plus order outstanding is less than 12 units.
- B. Order 10 units when the inventory at the beginning of the day plus order outstanding is less than 10 units.

Currently (on first day) the company has a stock of 17 units. The sequence of random number to be used is 08, 91, 25, 18, 40, 27, 85, 75, 32, 52 using first number for day one.

You are required to carry out a simulation run over a period of 10 days, recommend which option the manager should chose.

Answer

(a) Product life cycle costing.

It is an approach used to provide a long-term picture of product line profitability, feedback on the effectiveness of the life cycle planning and cost data to clarify the economic impact on alternatives choices in the design, engineering phase etc. It is also considered as a way to enhance the control of manufacturing costs. It is important to track and measure costs during each stage of a product's life cycle.

Characteristics:-

- (i) Product life cycle costing involves tracing of costs and revenues of each product over the several calendar periods throughout their entire life cycle.
- (ii) Product life cycle costing traces research and design and development costs and total magnitude of these costs for each individual product and compared with product revenue.
- (iii) Report generation for costs and revenues.

Benefits: -

- (i) The product life cycle costing results in earlier actions to generate revenue or to lower cost than otherwise might be considered.
- (ii) Better decision should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
- (iii) Product life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding.
- (iv) It provides an overall framework for considering total incremental costs over the life span of a product.

(b)

	I	II	III	IV
1	16	52	34	22
2	26	56	8	52
3	76	38	36	30
4	38	52	48	20

Step 1:

Subtract the smallest element of each row from every element of the corresponding row

	I	II	III	IV
1	0	36	18	6
2	18	48	0	44
3	46	8	6	0
4	18	32	28	0

Step 2:

Subtract the smallest element of each column from every element in that column

	I	II	III	IV
1	0	28	18	6
2	18	40	0	44
3	46	0	6	0
4	18	24	28	0

Step 3:

Draw minimum number of horizontal and vertical lines to cover all the zeros

	I	II	III	IV
1	0	28	18	6
2	18	40	0	44
3	46	0	6	0
4	18	24	28	0

The optimal assignment is

1	•	I	=	16
2	•	III	=	8
3	•	II	=	38
4	•	IV	=	20

82 hours

Minimum time taken = 82 hours

(c) Allocation of random numbers

<i>Demand</i>	<i>Probability</i>	<i>Cumulative prob.</i>	<i>Random numbers</i>
1	.1	.1	00-09
2	.2	.3	10-29
3	.3	.6	30-59
4	.3	.9	60-89
5	.1	1.0	90-99

Option I

<i>Day</i>	<i>Random numbers</i>	<i>Opening Stock</i>	<i>Demand</i>	<i>Closing Stock</i>	<i>Order placed</i>	<i>Order in</i>	<i>Average stock</i>
1	08	17	1	16	-	-	16.5
2	91	16	5	11	12		13.5
3	25	11	2	09	-	-	10.0
4	18	09	2	07	-	-	8.00
5	40	07	3	04	-	12	5.50
6	27	16	2	14	-	-	15.0
7	85	14	4	10	12	-	12.00

8	75	10	4	06	-	-	8.00
9	32	6	3	3	-	-	4.50
10	52	3	3	-	-	12	1.50
							94.5

Carrying cost (94.5×2.50) = Rs.236.25

Ordering cost (2×20) = Rs. 40.00
Rs.276.25

Option 11

Day	Random no.	Opening Stock	Demand	Closing Stock	Order placed	Order in	Average stock
1	08	17	1	16	-	-	16.5
2	91	16	5	11	-	-	13.5
3	25	11	2	09	10	-	10.0
4	18	09	2	07	-	-	8.00
5	40	07	3	04	-	-	5.50
6	27	04	2	02	-	10	3.00
7	85	12	4	08	10	-	10.00
8	75	08	4	04	-	-	6.00
9	32	04	3	01	-	-	2.50
10	52	01	3	-	-	10	0.50
							75.5

Carrying cost (75.5×2.50) = Rs.118.75

Ordering cost (2×20) = Rs. 40.00
Rs.228.75

It can be noticed that there will be stock – out on the 10th day in option II. However, since there is no cost implication mentioned in the question for such stock –outs, option II appears to be better.