# Paper 15- Strategic Cost Management- Decision Making

## Paper-15: Strategic Cost Management- Decision Making

**Time allowed:3 hours** **Full Marks: 100**

**The figures in the margin on the right side indicate full**

Answer Question No. 1 in Section A, which is compulsory, carrying 20 marks.Further, answer any 5(five) Questions from Section B, each carrying 16 marks

**Section A**
**(20 marks)**

**1. Choose the most appropriate answer to the following questions giving justification. 10 × 2 = 20**

(i) Stock Control data for Material P are: Annual usage: 3600 units; Cost per unit: ₹100/-; Cost of placing an order: ₹40;Stockholding Cost: 20% of the overall stock volume; Lead time: One month .The EOQ based on the above data is:
(a) 210 units
(b) 175 units
(c) 90 units
(d) 120 units

(ii) A company produces a product which is sold at a price of ₹ 160. Its Variable cost is ₹64. The company's Fixed cost is ₹23,04,000 p.a. The company operates at a margin of safety of 40%. The total sales of the company is:
(a) 42,000 units
(b) 40,000 units
(c) 60,000 units
(d) 50,000 units

(iii) For a Learning Curve percentage of 80%, the time to be taken to complete the 4th unit of a 12-unit job involved in the assembly line, if the initial unit requires 80 hours, will be
(a) 51.52 hrs
(b) 41.47 hrs
(c) 46.71 hrs
(d) 40.95 hrs

(iv) The P/V ratio of a firm dealing in Electrical equipment is 50% and the margin of safety is 40%. BEP of the firm at a sales volume of ₹ 50,00,000 will be
(a)₹ 25,00,000
(b) ₹35,00,000
(c) ₹30,00,000
(d) ₹ 36,00,000

(v) The following information relate to ABC

| | | |
|---|---|---|
| Activity level | 60% | 80% |
| Variable costs (₹) | 24,000 | 32,000 |
| Fixed costs (₹) | 40,000 | 44,000 |

The differential cost for 20% capacity is
(a)₹8,000
(b)₹4,000
(c)₹12,000
(d)₹10,000

(vi) Empire Hotel has a capacity of 100 single rooms and 20 double rooms. Average occupancy is 70% for 365 days of the year. The rent for a double room is kept at 150% of a single room. The total room occupancy days in a year in terms of single room is
(a)32193
(b)30660
(c)31660
(d)33215

(vii) By making and selling 9,000 units of a product, a company makes a profit of ₹10,000, whereas in the case of 7,000 units, it would lose ₹10,000 instead. The number of units to break-even is
(a)7,500 units
(b)8,000 units
(c)7,750 units
(d)8,200 units

(viii) If project A has a net present value (NPV) of ₹60,00,000 and project B has an NPV of ₹1,00,00,000, what is the opportunity cost if project B is selected?
(a)₹40,00,000
(b) ₹60,00,000
(c) ₹1,00,00,000
(d) ₹1,60,00,000

(ix) AB company is a supermarket group that incurs the following costs :
(A)The bought-in price of the goods
(B)Inventory finance costs
(C)Self refilling costs
(D)Costs of repacking or 'pack out' prior to storage before sale
AB company's calculating of direct product profit (DPP) would include
(a)Costs (A) and (C) only.
(b)All of the above cost except (B)
(c)All of the above costs except (d)
(d))All of the above costs

(x) In the context of Critical Path Analysis, the portion of the float of an activity which

cannot be consumed without affecting adversely the float of the subsequent activities is called
(a)Free float
(b)Interfering float
(c)Independent float
(d)Total float

**Answer:**
1
(i) d

EOQ= $\sqrt{\dfrac{2X3,600X40}{100X20\%}}$ =120 units

(ii) b
SP 160 – VC 64 = Contribution 96
F.C. 23,04,000 B.E.P. = 23,04,000/96 = 24,000 units
MOS = 40%; B.E.P. = 60%
∴ Total sales = 24, 000X 100/60= 40,000 units

(iii) a

At 80% Learning Curve,
T-4 - Time taken by the 4th Unit = 80 (.80)(.80) =51.20 hrs.
Note: In the arithmetic method followed above, every time the number the number of repetitions doubles, the time to perform the activity is reduced by the Learning Curve Coefficient.

(iv) c
Actual Sales - M.O.S.= BEP Sales
Sales = ₹ 50,00,000
Less: Margin of safety 40% on sales = ₹ 20,00,000
Break even sales = ₹ 30,00,000

(v) C
Differential Costs = Differences in Fixed and Variable Cost = ₹ 8000 + ₹4,000 = ₹ 12,000

(vi) d
1 double room = 1.5 single in terms of revenue.
Capacity = 100 + 1.5 × 20 = 100 + 30 = 130 equivalent single rooms.
Total Room Occupancy p.a. = 130× 365 × 70% = 33215 days.
Note: This can be arrived at by other ways also, taking for example 70% of only single rooms and then double rooms, etc

(vii) b
Contribution for 2000 units = 20,000 (difference in profits for two output levels)
Hence, contribution per unit = 10.
Substituting in equation 1,00,000 = F + 10,000.
Or F = 80,000.BEP = 80000 / 10 = 8000.

(viii) b
Opportunity cost represents the next best alternative foregone.If B is chosen, only A is being foregone and hence the NPV of ₹60,00,000 is the present value of the opportunity lost.

(ix) d
Because all of the costs mentioned can be identified with specific goods/product and would be deducted from the selling price to determine the direct product profit.

(X) b
Interfering float is that part of the total float which causes areduction in the float of the successor activities. It is the difference between the latest finish time of the activity in question and the earliest starting time of the following activity or zero, whichever is larger.

Section-B
Answer any five questions.
Each Question caries 16 marks 16 X5=80

**2(a)** A factory has a key resource (bottleneck) of Facility A which is available for 31,300 minutes per week. Budgeted factory costs and data on two products, X and Y, are shown below

| Product | Selling Price/Unit (₹) | Material Cost/Unit (₹) | Time Facility A |
|---|---|---|---|
| X | 35 | 20.00 | 5 minutes |
| Y | 35 | 17.50 | 10 minutes |

Budgeted factory costs per week:

| | ₹ |
|---|---|
| Direct labour | 25,000 |
| Indirect labour | 12,500 |
| Power | 1,750 |
| Depreciation | 22,500 |
| Space costs | 8,000 |
| Engineering | 3,500 |
| Administreation | 5,000 |

Actual production during the last week is 4,750 units of product X and 650 units of product Y. Actual factory cost was ₹78,250.
Calculate:

(i)Total factory costs (TFC)
(ii)Cost per Factory Minute
(iii)Return per Factory Minute for both products
(iv)TA ratios for both products.
(v)Throughput cost per the week.
(vi) Efficiency ratio **10**

**(b)** A practicing Cost and Management Accountant now spends ₹0.90 per K.m on taxi fares for his client's work. He is considering two other alternatives the purchase of a new small car or an old bigger car.

| Item | New Small Car (₹) | Old Bigger Car(₹) |
|---|---|---|
| Purchase Price | 35,000 | 20,000 |
| Sale price after 5 years | 19,000 | 12,000 |
| Repairs and Servicing p.a | 1,000 | 1,200 |
| Taxes and insurance p.a | 1,700 | 700 |
| Petrol consumption per liter (k.m) | 10 | 7 |
| Petrol price per liter | 3.5 | 3.5 |

He estimates that he does 10,000 Km annually. Which of the three alternatives will be cheaper? If his practice expands he has to do 19,000 Km p.a. where will the cost of the two cars break even and why? Ignore interest and Income-tax. **6**

**Answer:2(a)**

(i) Total Factory Costs = Total of all costs except materials.
= ₹ 25,000 + ₹ 12,500 + ₹ 1,750 + ₹ 22,500 + ₹ 8,000 + ₹ 3,500 + ₹ 5,000.= ₹ 78,250

(ii) Cost per Factory Minute = Total Factory Cost ÷ Minutes available= ₹ 78,250 ÷ 31,300 = ₹ 2.50

(iii)

(a)Return per bottleneck minute for Product X = $\dfrac{Selling\ Price\ - Material\ Cost}{Minutes \text{ in } bottleneck}$
= (35 – 20) / 5 = ₹ 3

(b)Return per bottleneck minute for Product Y = $\dfrac{Selling\ Price\ - Material\ Cost}{Minutes \text{ in } bottleneck}$
= (35 – 17.5) / 10 = ₹ 1.75

(iv)Throughput Accounting (TA) Ratio for Product X = Return per Minute/Cost per Minute
= (3 / 2.5) = ₹ 1.2
Throughput Accounting (TA) Ratio for Product Y =Return per Minute/Cost per Minute
= (1.75 / 2.5) = ₹ 0.7

Based on the review of the TA ratios relating to two products, it is apparent that if we only made Product Y, the enterprise would suffer a loss, as its TA ratio is less than 1. Advantage will be achieved, when product X is made.

(v)Standard minutes of throughput for the week:= [4,750 x 5] + [650 x 10]
= 23,750 + 6,500 = 30,250 minutes

Throughput cost per week:= 30,250 x ₹ 2.5 per minutes = ₹ 75,625

(vi)Efficiency %= (Throughput cost / Actual TFC)
= (₹ 75,625 / ₹ 78,250) x 100
= 96.6%The bottleneck resource of Facility A is available for 31,300 minutes per week but produced only 30,250 standard minutes. This could be due to:

(a)the process of a 'wandering' bottleneck causing facility A to be underutilized.

(b)inefficiency in facility A

**2(b)** Statement Showing computation of break even point for three alternatives

| | Taxi Amount(₹) | New Smaller Car Amount(₹) | Old Bigger Car Amount(₹) |
|---|---|---|---|
| Fixed Cost: | | | |
| Depreciation | | 16000/5=3200 | 8000/5=1600 |
| Repairs | | 1000 | 1200 |
| Taxes and Insurance | | 1700 | 700 |
| Total Fixed Cost(A) | | 5900 | 3500 |
| Variable Cost Per KM(B) | 0.9 | 0.35 | 0.5 |
| Total Variable Cost for 10,000 KM )(C) | 9000 | 3500 | 5000 |
| Total Variable Cost for 19,000 KM )(D) | 17100 | 6650 | 9500 |
| Total Cost For 10,000 KM(A+C) | 9000 | 9400 | 8500 |
| Total Cost For 19,000 KM(A+D) | 17100 | 12550 | 13000 |

(a)At 10000 KMS old bigger car is cheaper than the other two alternatives.

(b)At 19000 KMS it is better and cheaper to purchase the new smaller car.

Indifference point = (difference in fixed cost / difference in variable cost per unit) = (2400/0.15)
= 16000kms

**3(a)**Accelerate Co. Ltd., manufactures and sells four types of products under the brand names of A, B, C and D. The sales mix in value comprises 33 1/3%, 41 2/3%, 16 2/3% and 8 1/3% of products A, B, C and D, respectively. The total budgeted sales (100%) are ₹ 1,20,000 p.m. Operating Costs are—Variable costs: Product A 60% of selling price, Product B 68% of selling price, Product C 80% of selling price, Product D 40% of selling price; Fixed costs: ₹ 29,400 p.m.
Required:
Calculate the break-even-point for the products on overall basis. **8**

**(b)** The profit for The Forward Look Ltd. works out to 12.5% of the capital employed and the relevant figures are as under :

₹

| | |
|---|---|
| Sales | 5,00,000 |
| Direct Material | 2,50,000 |
| Direct Labour | 1,00,000 |
| Variable Overheads | 40,000 |
| Capital Employed | 4,00,000 |

The new Sales Manager who has recently joined the Company estimates for the next year a profit of about 23% on the capital employed provided the volume of Sales is increased by 10% and simultaneously there is an increase in Selling Price of 4% and an overall cost reduction in all the elements of cost by 2%.

Verify the contention of the Sales Manager by computing in detail the cost and profit for the next year and state whether his proposal can be adopted by the management. **8**

**Answer 3(a)** **(₹)**

| | Particulars | A | B | C | D | Total |
|---|---|---|---|---|---|---|
| a | Sales | 40,000 | 50,000 | 20,000 | 10,000 | 1,20,000 |
| b | Variable cost | 24,000 | 34,000 | 16,000 | 4,000 | 78,000 |
| c | Contribution | 16,000 | 16,000 | 4,000 | 6,000 | 42,000 |
| d | Fixed cost | | | | | 29,400 |
| e | Profit | | | | | 12,600 |
| f | P/V ratio | 40% | 32% | 20% | 60% | 35% |
| g | Break even sales | | 29,400/35% | | | 84,000 |

**(b) Computation of Fixed Cost:** **(₹)**

| | | |
|---|---|---|
| Annual Sales | | 5,00,000 |
| Less Profit: 4,00,000 X 12.5% | | 50,000 |
| Total Cost | | 4,50,000 |
| Less Variable Cost | | |
| Direct Material | 2,50,000 | |
| Direct labour | 1,00,000 | |
| Variable Overhead | 40,000 | 3,90,000 |
| | | 60,000 |

**Statement showing Profit obtained upon adopting Sales Manager's proposal**

| | |
|---|---|
| (i) Revised Sales: 5,00,000 X 110% X 104% | 5,72,000 |
| (ii) Variable Cost: 3,90,000 X 110% X98% | 4,20,400 |
| (iii) Contribution | 1,51,580 |
| (iv) Fixed Cost 60,000 X 98% | 58,800 |
| (v) Profit | 92,780 |

Percentage of Profit on Capital Employed = (Rs.92,780 /4,00,000) ×100 = 23.195 > 23%

Conclusion : The Sales Manager's proposal can be adopted.

**4(a)** A brass foundry making castings which are transferred to the machine shop of the company at standards in regard to material stocks which are kept at standard price are as follows:-

Standard Mixture 70% Copper : 30% Zinc
Standard Price Copper ₹2,400 per ton
Zinc ₹ 650 per ton
Standard loss in melting 5% of input
Figures in respect of a costing period are as follows:

| | | | |
|---|---|---|---|
| Commencing stocks | Copper | 100 tons | |
| | Zinc | 60 tons | |
| | Copper | 110 tons | |
| | Zinc | 50 tons | |
| | Copper | 300 tons | |
| | Zinc | 100 tons | |
| Metal Melted | 400 tons | | |
| Casting produced | 3758 tons | | |

Present figures showing : Material Price, Mixture and Yield Variance. **8**

**(b)** Requisites for Installation of a Uniform Costing System. **8**

**Answer:4(a)**

| | Copper | | Zinc | |
|---|---|---|---|---|
| | Q | V | Q | V |
| Opening Stock | 100 | 240000 | 60 | 39000 |
| Add: Purchases | 300 | 732500 | 100 | 62500 |
| | 400 | 972500 | 160 | 101500 |
| Less :Closing Stock | 110 | 264000 | 50 | 32500 |
| | 290 | 708500 | 110 | 69000 |

| | Standard | | | Actual | | |
|---|---|---|---|---|---|---|
| | Q | P | V | Q | P | V |
| Copper | 280 | 2400 | 672000 | 290 | | 708500 |
| Zinc | 120 | 650 | 78000 | 110 | | 69000 |
| | 400 | | 750000 | 400 | | 777500 |
| less: Standard loss @5% | 20 | | | 25 | | |
| | 380 | | 750000 | 375 | | 777500 |

| | | | | |
|---|---|---|---|---|
| Copper | 6276.31 X 2400 =663157 | | 290 X 2400 =696000 | |
| Zinc | 118.42 X 650 =76975 | | 110 X 650 = 71500 | |
| Total | 740132 | 750000 | 767500 | 777500 |

Material yield variance = 9868 (A)

Material price variance =10000 (A)
Material mix variance =17500(A)

**4(b)**

Requisites for Installation of a Uniform Costing System:

The organisational set up for implementing the principles and methods of Uniform Costing may take different forms. It may range from a small association of a number of concerns who agree to have uniform information regarding a few specific cost accounting respects, to be a large organisation which has a fully developed scheme covering all the aspects of costing. The success of a uniform costing system will depend upon the following:

(a)There should be a spirit of mutual trust, co-operation and a policy of give and take amongst the participating members.
(b)There should be a free exchange of ideas and methods.
(c)The bigger units should be prepared to share with the smaller ones, improvements, achievements of efficiency, benefits of research and know-how.
(d)There should not be any hiding or withholding of information.
(e)There should be no rivalry or sense of jealousy amongst the members.

In the application of Uniform Costing, the fundamental requirement is, therefore, to locate such differences and to eliminate or overcome, as far as practicable, the causes giving rise to such differences. The basic reasons for the differences may be as follows:

**(a)Size and organisational set up of the business:**

The number and size of the departments, sections and services also vary from one concern to another according to their size and organisation. The difficulty in operating Uniform Cost Systems for concerns which vary widely in regard to size and type of business may to some extent be overcome by arranging the various units in a number of size or type ranges, and applying different uniform systems for each such type.

**(b)Methods of production:**

The use of different types of machines, plant and equipments, degree of mechanization, difference in materials mix and sequence and nature of operations and processes are mainly responsible for the difference in costs.

**(c)Methods and principles of cost accounting applied:**

It is in this sphere that the largest degree of difference arises. Undertakings manufacturing identical or similar products and having the same system of cost accounting would generally employ different methods of treatment of expenditure on buying, storage and issue of materials, pricing of stores issues, payment to workers, basis of classification and absorption of overhead, calculation of depreciation, charging rent on freehold or leasehold assets etc.

**5(a)** XYZ Ltd which has a system of assessment of Divisional Performance on the basis of residual income has two Divisions, Alfa and Beta. Alfa has annual capacity to manufacture 15,00,000 numbers of a special component that it sells to outside customers, but has idle capacity. The budgeted residual income of Beta is ₹ 1,20,00,000 while that of Alfa is ₹ 1,00,00,000. Other relevant details extracted from the budget of Alfa for the current year were as follows

| Particulars | |
|---|---|
| Sale (Outside Cutomer) | 12,00,000 @ ₹ 180 |
| Variale cost p.u | 160 |

| | |
|---|---|
| Divisional fixed cost | ₹ 80,00,000 |
| Capital employed | 9,00,00,000 |
| Cost of Capital | 10% |

Beta has just received a special order for which it requires components similar to the ones made by Alfa. Fully aware of the idle capacity of Alfa, beta has asked Alfa to quote for manufacture and supply of 3,00,000 numbers of the components with a slight modification during final processing. Alfa and Beta agree that this will involve an extra variable cost of ₹ 6 per unit.

You are required to calculate

Calculate the transfer price which Alfa should quote to Beta to achieve its budgeted residual income. **8**

**(b)** PB Ltd. has decided to adopt JIT policy for materials. The following effects of JIT policy are identified-

(1)To implement JIT, the company has to modify its production and material receipt facilities at a capital cost of ₹10,00,000. The new machine will require a cash operating cost ₹1,08,000 p.a. The capital cost will be depreciated over 5 years.

(2)Raw material stockholding will be reduced from ₹40,00,000 to ₹10,00,000.

(3)The company can earn 15% on its long-term investments.

(4)The company can avoid rental expenditure on storage facilities amounting to ₹33,000 per annum. Property Taxes and insurance amounting to ₹ 22,000 will be saved due to JIT programme.

(5)Presently there are 7 workers in the store department at a salary of ₹5,000 each per month. After implementing JIT scheme, only 5 workers will be required in this department. Balance 2 workers' employment will be terminated.

(6)Due to receipt of smaller lots of Raw Materials, there will be some disruption of production. The costs of stock-outs are estimated at ₹77,000 per annum.

Determine the financial impact of the JIT policy. Is it advisable for the company to implement JIT system? **8**

**Answer:5(a)**

| | ₹ |
|---|---|
| Fixed Cost | 80,00,000 |
| Return on 9,00,00,000 X 10% | 90,00,000 |
| Residual Income | 1,00,00,000 |
| Total Contribution Required | 2,70,00,000 |

Contribution derivedfrom existing units = 12,00,000 X 20 =₹2,40,00,000

Contribution required on 3,00,000 units = 2,70,00,000 -2,40,00,000 =₹30,00,000

Contribution per unit =30,00,000 / 3,00,000 =₹10

Increase in Variable cost = ₹ 6

∴ Transfer price = V.C + Desired Residual Income + Increase in VC

= 160+10+6

=₹176

**5(b)**

| Costs | | Benefit | |
|---|---|---|---|
| Interest on capital for modifying production facilities (₹10,00,000×15%) | 1,50,000 | Interest on investment on released funds (₹40,00,000-`10,00,000) ×15% | 4,50,000 |
| Operating Costs of new production facilities | 1,08,000 | Saving in salary of 2 workers terminated (₹5,000×12 months×2) | 1,20,000 |
| Depreciation of new production facilities | Nil | Saving in rental Expenditure | 33,000 |
| Stock-Outs Costs (given) | 77,000 | Saving in Property Tax & Insurance | 22,000 |
| Net Benefit due to JIT policy | 2,90,000 | Total | |
| Total | 6,25,000 | | 6,25,000 |

Conclusion: The JIT policy may be implemented, as there is a Net Benefit of ₹2,90,000 per annum.
Note: Depreciation, being apportionment of capital cost, is ignored in decision-making, Tax Saving on Depreciation is not considered in the above analysis.

**6(a)**The following was the pattern for demand of cars rented out by a tourist operator observed for 100 days :

| | | | | |
|---|---|---|---|---|
| No of Cars | 5 | 7 | 10 | 15 |
| No of Days | 20 | 30 | 40 | 10 |

The random numbers are 88, 76, 10, 05, 23 Required :
(i) Simulate the demand for cars over five days.
(ii) How many cars should the operator have in order to have at least 75% probability of fulfilling the demand based on your simulated results ? **5+3=8**

**(b)**A company has four zones open and four salesmen available for assignment. The zones are not equally rich in their sales potentials. It is estimated that a typical salesman operating in each zone would bring in the following annual sales:

Zone: A: 1,26,000: Zone B:1,05,000; Zone C: 84,000; Zone D: 63,000.

The four salesmen are also considered to differ in ability. It is estimated that working under the same condition their yearly sales would be proportionately as follows:

Salesman P:7; Salesman Q: 5; Salesman R:5; Salesman S:4. If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment. **8**

**Answer:**
**6(a)**

| No. of cars | No.of Days | Probability | Cumulative Prob | Randam No. Interval | Day | Random No. | Demand |
|---|---|---|---|---|---|---|---|
| 5 | 20 | 0.2 | 0.2 | 00-19 | 1 | 88 | 10 |
| 7 | 30 | 0.3 | 0.5 | 20-49 | 2 | 76 | 10 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | 40 | 0.4 | 0.9 | 50-89 | 3 | 10 | 5 |
| 15 | 10 | 0.1 | 1 | 90-99 | 4 | 5 | 5 |
| | | | | | 5 | 23 | 7 |

(i) For 75% or more probability, we need more than 3 days when demand is fulfilled i.e 3/5=60%,therefore at least 4 days' demand is fulfilled.
(ii) In this case,10 cars when there is a 100% chance of all demand being fulfilled based on simulated results.

**6(b)**

**Sales Matrix**

| Sales Man | A | B | C | D |
|---|---|---|---|---|
| P | 42 | 35 | 28 | 21 |
| Q | 30 | 25 | 20 | 15 |
| R | 30 | 25 | 20 | 15 |
| S | 24 | 20 | 16 | 12 |

**Loss Matrix**
(Reducing all elements from highest element)

| | | | |
|---|---|---|---|
| 0 | 7 | 14 | 21 |
| 12 | 17 | 22 | 27 |
| 12 | 17 | 22 | 27 |
| 18 | 22 | 26 | 30 |

**Row Operation**

| | | | |
|---|---|---|---|
| 0 | 7 | 14 | 21 |
| 0 | 5 | 10 | 15 |
| 0 | 5 | 10 | 15 |
| 1 | 4 | 8 | 12 |

**Column Operation**

| | | | |
|---|---|---|---|
| $\boxed{0}$ | 3 | 6 | 9 |
| 0 | 1 | 2 | 3 |
| 0 | 1 | 2 | 3 |
| 0 | $\boxed{0}$ | 0 | 0 |

**Improved Matrix 1**

| | | | |
|---|---|---|---|
| $\boxed{0}$ | 2 | 5 | 8 |
| 0 | $\boxed{0}$ | 1 | 2 |
| 0 | 0 | 1 | 2 |
| 1 | 0 | $\boxed{0}$ | 0 |

**Improved Matrix 2**

| | | | |
|---|---|---|---|
| $\boxed{0}$ | 2 | 4 | 7 |
| 0 | $\boxed{0}$ | 0 | 1 |
| 0 | 0 | $\boxed{0}$ | 1 |
| 2 | 1 | 0 | $\boxed{0}$ |

Allocation
P – A - 42
Q – B - 25
R – C - 20
S – D - 12
99 X 3000 =2,97,000 Maximum sales

**7(a)** Given the following information regarding a project and the time duration of each activity :

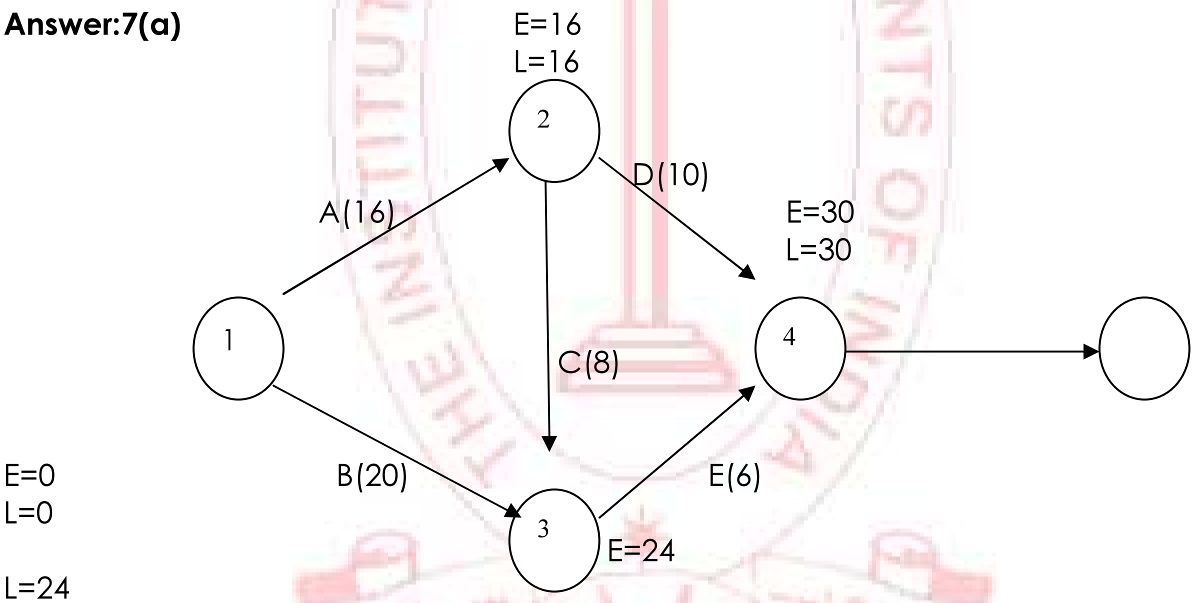
| Activity | Preceding activity | Normal Time (days |
|---|---|---|

| | | |
|---|---|---|
| A | - | 16 |
| B | - | 20 |
| C | A | 8 |
| D | A | 10 |
| E | B,C | 6 |
| F | D,E | 12 |

Required :
(i)Draw the activity network of the project.
(ii)Find critical path and duration of the project.
(iii)Find the total float and free-float for each activity. **2+2+4 = 8**

**(b)** A Company produces the products P, Q and R from three raw materials A, B and C. One unit of product P requires 2 units of A and 3 units of B. A unit of product Q requires 2 units of B and 5 units of C and one unit of product R requires 3 units of A, 2 unit of B and 4 units of C. The Company has 8 units of material A, 10 units of B and 15 units of C available to it. Profits/unit of products P, Q and R are ₹3, ₹5 and ₹4 respectively.
(i)Formulate the problem mathematically,
(ii)Write the Dual problem.

**Answer:7(a)**




A ⟶ D ⟶ F=16+10+12=38
B ⟶E ⟶ F=20+6+12=38

(ii)A-C-E-F=16+8+6+12=42days(Critical Path)
(iii)

| Activity | Normal time(Days) | EST | EFT | LST | Total Float | Free Float |
|---|---|---|---|---|---|---|
| A | 16 | 0 | 0 | 16 | 0 | 0 |
| B | 20 | 0 | 4 | 24 | 4 | 4 |
| C | 8 | 16 | 24 | 24 | 0 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| D | 10 | 16 | 26 | 30 | 4 | 4 |
| E | 6 | 24 | 30 | 30 | 0 | 0 |
| F | 12 | 30 | 42 | 42 | 0 | 0 |

**7(b)**

| Raw Materials | P | Q | R | Available units |
|---|---|---|---|---|
| A | 2 | - | 3 | 8 |
| B | 3 | 2 | 2 | 10 |
| C | - | 5 | 4 | 15 |

Profits 3/- 5/- 4/-

Let $x_1$ be the no. of units of P

Let $x_2$ be the no. of units of Q

Let $x_3$ be the no. of units of R

Objective function: Max. $Z = 3x_1+ 5x_2+4x_3$

Subject to constraints:

$2x_1+3x_3 \leq 8$

$3x_1+2x_2+2x_3 \leq 10$

$5x_2+4x_3 \leq 15$

And $x_1,x_2,x_3 \geq 0$.

Primal

Max.$Z = 3x_1+5x_2+4x_3$

Subject to

$2x_1+3x_3 \leq 8$

$3x_1+2x_2+2x_3 \leq 10$

$5x_2+4x_3 \leq 15$

And $x_1$, $x_2$, $x_3 \geq 0$

Dual

Min. $Z = 8y_1+10y_2+15y_3$

Subject to

$2y_1+3y_2 \geq 3$

$2y_2+5y_3 \geq 5$

$3y_1+2y_2+4y_3 \geq 4$

And $y_1$, $y_2$, $y_3 \geq 0$

$2x_1+3x_2 + S1= 8$

$3x_1+2x_2+2x_3 + S_2 = 10$

$5x_2+4x_3 + S_3 = 15$

Max $Z = 3x_1+ 5x_2+4x_3+0.S_1+0.S_2+0.S_3$

$\therefore x_1= 23/20$

$x_2= 19/10$

$x_3$= 11/8
Z = 18.45

**8.**Write short notes on any four of the following: **4x4= 16**
**(a)** Back flush Accounting
**(b)** Life Cycle Costing
**(c)** Assignment
**(d)**Features of Target Costing
**(e)**Principles of Total Quality Management (TQM)

**Answer:**
**8(a)** Backflush accounting is when you wait until the manufacture of a product has been completed, and then record all of the related issuances of inventory from stock that were required to create the product. This approach has the advantage of avoiding all manual assignments of costs to products during the various production stages, thereby eliminating a large number of transactions and the associated labor. This system records the transaction only at the termination of the production and sales cycle. The emphasis is to measure cost at the beginning and at the end with greater emphasis on the end or outputs. Backflush accounting is entirely automated, with a computer handling all transactions.

The backflushing formula is:Number of units produced xunit count listed in the bill of materials for each component.

**(b)** Life Cycle Costing; aims at cost ascertainment of a product, project etc. over its projected life. It is a system that tracts and accumulates the actual costs and revenues attributable to cost object (i.e.,product) from its inception to its abandonment. Sometimes the terms; cradle-to-grave costing and womb-to-tomb costing convey the meaning of fully capturing all costs associated with the product from its initial to final stages.

Product Life Cycle is a pattern of expenditure, sale level, revenue and profit over the period from new idea generation to the deletion of product from product range. It spans the time from initial R&D on a product to when customer servicing and support is no longer offered for the product. Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Traces research, design and development costs and total magnitude of these costs for each individual product and compared with product revenue. Assists report generation for costs and revenues.

**(c)** Assignment is a special linear programming problem. There are many situations where the assignment of people or machines etc. may be called for. Assignment of workers to machines, clerks to various check-out counters, salesmen to different sales areas are typical examples of these. The Assignment is a problem because people possess varying abilities for performing different jobs and therefore the costs of performing jobs by different people are different. Thus, in an assignment problem, the question is how the assignments should be made in order that the total cost involved is minimized.
The following are the methods of solving an assignment problem. They are:
(1) Complete Enumeration Method
(2) Simplex Method
(3) Transportation Method and
(4) Hungarian Method

**8(d)** Target Costing is defined as “a structured approach in determining the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated selling price." The main features or practices followed in Target Costing are:

Step 1: Identify the market requirements asregards design, utility and need for a new product or improvements of existing product.

Step 2: Set Target Selling Price based on customer expectations and sales forecasts.

Step 3: Set Target Production Volumes based on relationships between price and volume.

Step 4: Establish Target Profit Margin for each product, based on the company's long term profit objectives, projected volumes, and course of action, etc.

Step 5: Set Target Cost (or Allowable cost) per unit, for each product. Target cost = Target selling price less Target profit margin

Step 6: Determine Current Cost of producing the new product, based on available resources and conditions.

Step 7: Set cost reduction Target in order to reduce the Current Cost to the Target Cost.

Step 8: Analyze the Cost Reduction Target into various components and identify cost reduction opportunities using Value Engineering (VE) and Value Analysis (VA) and Activity Based Costing (ABC)

Step 9: Achieve cost reduction and Target profit by Effective Implementation of Cost Reduction decisions

Step 10: Focus on further possibilities of cost reduction ie Continuous Improvement program.

**8(e)** Principles of Total Quality Management (TQM):
The philosophy of TQM rest on the following principles, which are enlisted below:
(i)Clear exposition of the benefits of a project.
(ii)Total Employee Involvement (TEI).
(iii)Process measurement.
(iv)Involvement of all customers and contributors.
(v)Elimination of irrelevant data.
(vi)Understanding the needs of the whole process.
(vii)Use of errors to prompt continuous improvement.
(viii)Use of statistics to tell people how well they are doing.