

Roll No

Total No. of Questions—5]

[Total No. of Printed Pages—8

Time Allowed—3 Hours

Maximum Marks—100

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Answers to questions are to be given only in English except in the case of candidates who have opted for Hindi medium. If a candidate who has not opted for Hindi medium, answers in Hindi, his answers in Hindi will not be valued.

Answer all the questions.

Working notes should form part of the answer.

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1. (a) X Ltd. is engaged in the production of four products : A, B, C and D. The price charged for the four products are Rs. 180, Rs. 175, Rs. 130 and Rs. 180 respectively. Market research has indicated that if X Ltd can reduce the selling prices of its products by Rs. 5, it will be successful in getting bulk orders and gain a significant share of market of those products. The company's profit markup is 25 per cent on cost of the product. The relevant information of products are as follows :

| Products | A | B | C | D |
|--------------------------|-----|-----|-----|-----|
| Output in units | 600 | 500 | 400 | 600 |
| Cost per unit : | | | | |
| Direct material (in Rs.) | 40 | 50 | 30 | 60 |
| Direct labour (in Rs.) | 28 | 21 | 14 | 21 |
| Machine hours (per unit) | 4 | 3 | 2 | 3 |

The four products are usually produced in production runs of 20 units and sold in batches of 10 units. The production overhead is currently absorbed by

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using a machine hour rate, and the total of the production overheads for the period has been analysed as follows :

| | (Rs.) |
|--------------------------------|--------|
| Machine department costs | 52,130 |
| Setup costs | 26,250 |
| Stores receiving | 18,000 |
| Inspection/Quality control | 10,500 |
| Material handling and dispatch | 23,100 |

The cost drivers to be used for the overhead costs are as follows :

| <u>Cost</u> | <u>Cost drivers</u> |
|---------------------------------|---------------------------|
| Setup costs | Number of production runs |
| Store receiving | Requisitions raised |
| Inspection/Quality control | Number of production runs |
| Materials handling and dispatch | Order executed |

The number of requisitions raised in the stores was 100 for each product and the number of orders executed was 210, each order being for a batch of 10 units of a product.

You are required :

- (i) To compute the target cost for each product.
 - (ii) To compute total cost of each product using activity based costing.
 - (iii) Compare target cost and activity based cost of each product and comment whether the price reduction is profitable or not.
- (b) A company is launching a new product and has made estimates of the time for the various activities associated with the launch as follows :

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| Activity | Predecessor | Times (Days) | | |
|----------|-------------|--------------|-------------|-------------|
| | | Optimistic | Most likely | Pessimistic |
| A | NONE | 1 | 3 | 5 |
| B | NONE | 3 | 4 | 5 |
| C | A, B | 1 | 3 | 11 |
| D | B | 3 | 3 | 9 |
| E | A | 1 | 2 | 3 |
| F | C | 2 | 5 | 14 |
| G | E, F | 2 | 3 | 4 |
| H | D, F | 2 | 2 | 2 |
| I | G, H | 10 | 10 | 10 |

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Required :

- (i) Draw the network diagram.
 - (ii) Calculate the expected time and variance of each activity.
 - (iii) Find out the expected length of critical path and its standard deviation.
 - (iv) Find the probability that the launching will be completed in 27 days.
 - (v) Find the duration, which has 95% probability of completion.
- (c) The following information is provided by a firm. The factory manager wants to use appropriate average learning rate on activities so that he may forecast costs and prices for certain levels of activity.
- (i) A set of very experienced people feed data into the computer for processing inventory records in the factory. The manager wishes to apply 80% learning rate on data entry and calculation of inventory.
 - (ii) A new type of machinery is to be installed in the factory. This is patented process and the output may take a year for full fledged production. The factory manager wants to use a learning rate on the workers at the new machine.
 - (iii) An operation uses contract labour. The contractor shifts people among various jobs once in two days. The labour force performs one task in 3 days. The manager wants to apply an average learning rate for these workers.

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You are required to advise to the manager with reasons on the applicability of the learning curve theory on the above information.

2. (a) The following information relates to a manufacturing concern :

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| Standard | (Rs.) |
|--|----------|
| Material A 24,000 kgs @ Rs. 3 per kg | 72,000 |
| Material B 12,000 kgs @ Rs. 4 per kg | 48,000 |
| Wages 60,000 hours @ Rs. 4 per hour | 2,40,000 |
| Variable overheads 60,000 hours @ Re. 1 per hour | 60,000 |
| Fixed overheads 60,000 hours @ Rs. 2 per hour | 1,20,000 |
| Total cost | 5,40,000 |
| Budgeted profit | 60,000 |
| Budgeted sales | 6,00,000 |
| Budgeted production (units) | 12,000 |

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| Actual | (Rs.) |
|---------------------------------|-----------|
| Sales (9,000 units) | 4,57,500 |
| Material A consumed 22,275 kgs. | 62,370 |
| Material B consumed 10,890 kgs | 44,649 |
| Wages paid (48,000 hours) | 1,91,250 |
| Fixed overhead | 1,20,900 |
| Variable overhead | 45,000 |
| Labour hours worked | 47,700 |
| Closing work in progress | 900 units |
| Degree of completion : | |
| Material A and B | 100% |
| Wages and overheads | 50% |

You are required to :

- (i) Calculate all the material and labour variances.
 - (ii) Calculate variable overhead expenditure and efficiency variances, fixed overhead expenditure and volume variances and sales price and sales volume variances.
- (b) Mr. X has taken a shop on lease and made a down payment of Rs. 2,50,000. Additionally, the rent under lease amount is Rs. 96,000 per annum. If lease agreement is cancelled by Mr. X, then the initial payment is forfeited. Mr. X plans to use the shop for the general stores business, and has estimated operations for the next year as follows :

| | | |
|-----------------------------------|---------------|-----------|
| Sales | Rs. 25,00,000 | |
| Less : Value added tax (VAT) | Rs. 2,80,000 | |
| Sales after VAT | | 22,20,000 |
| Cost of goods sold | 12,50,000 | |
| Wages and wages related cost | 2,76,000 | |
| Rent including down payment | 3,46,000 | |
| Rates, lighting and insurance | 2,80,000 | |
| Audit, legal and general expenses | 50,000 | 22,02,000 |
| Net profit before tax | | 18,000 |

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In the business, Mr. X will be devoting half of his time, however no provision has been made for his remuneration/salary. Mr. X also has an option to sublet the shop to his friend for a monthly rent of Rs. 18,000, if he does not use the shop himself.

You are required to :

- (i) Identify the sunk and opportunity cost in the above problem.
- (ii) State most profitable decision, which should be taken by Mr. X, supporting with appropriate calculation.
- (c) Explain four P's of quality improvement principle. 4
3. (a) At a small store of readymade garments, there is one clerk at the counter who is to check bills, receive payments and place the packed garments into fancy bags. The arrival of customer at the store is random and service time varies from one minute to six minutes, the frequency distribution for which is given below : 9

| Time between arrivals (minutes) | Frequency | Service Time (in minutes) | Frequency |
|------------------------------------|-----------|------------------------------|-----------|
| 1 | 5 | 1 | 1 |
| 2 | 20 | 2 | 2 |
| 3 | 35 | 3 | 4 |
| 4 | 25 | 4 | 2 |
| 5 | 10 | 5 | 1 |
| 6 | 5 | 6 | 0 |

The store starts work at 11 a.m. and closes at 12 noon for lunch and the customers are served on the "first come first served basis".

Using Monte Carlo simulation technique, find average length of waiting line, average waiting time, average service time and total time spent by a customer in system.

You are given the following set of random numbers, first twenty for arrivals and last twenty for service :

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|
| 64 | 04 | 02 | 70 | 03 | 60 | 16 | 18 | 36 | 38 |
| 07 | 08 | 59 | 53 | 01 | 62 | 36 | 27 | 97 | 86 |
| 30 | 75 | 38 | 24 | 57 | 09 | 12 | 18 | 65 | 25 |
| 11 | 79 | 61 | 77 | 10 | 16 | 55 | 52 | 59 | 63 |

- (b) What is Margin of safety ? How, margin of safety can be improved ?
- (c) Explain briefly stages involved in the process of Bench marking.
4. (a) An agro-products producer company is planning its production for next year. The following information is relating to the current year :

| Products/Crops | A1 | A2 | B1 | B2 |
|------------------------------|-------|-------|-------|-------|
| Area occupied (acres) | 250 | 200 | 300 | 250 |
| Yield per acre (ton) | 50 | 40 | 45 | 60 |
| Selling price per ton (Rs.) | 200 | 250 | 300 | 270 |
| Variable cost per acre (Rs.) | | | | |
| Seeds | 300 | 250 | 450 | 400 |
| Pesticides | 150 | 200 | 300 | 250 |
| Fertilizers | 125 | 75 | 100 | 125 |
| Cultivations | 125 | 75 | 100 | 125 |
| Direct wages | 4,000 | 4,500 | 5,000 | 5,700 |

Fixed overhead per annum (Rs.) 53,76,000.

The land that is being used for the production of B1 and B2 can be used for either crop, but not for A1 and A2. The land that is being used for A1 and A2 can be used for either crop, but not for B1 and B2. In order to provide adequate market service, the company must produce each year at least 2,000 tons each of A1 and A2 and 1,800 tons each of B1 and B2.

You are required to :

- (i) Prepare a statement of the profit for the current year.
- (ii) Profit for the production mix by fulfilling market commitment.
- (iii) Assuming that the land could be cultivated to produce any of the four products and there was no market commitment, calculate : Profit amount of most profitable crop and break-even point of most profitable crop in terms of acres and sales value.

- (b) An oil refinery can blend three grades of crude oil to produce quality A and quality B petrol. Two possible blending processes are available. For each production run, the older process uses 5 units of crude Q, 7 units of crude P and 2 units of crude R and produces 9 units of A and 7 units of B. The newer process uses 3 units of crude Q, 9 units of crude P and 4 units of crude R to produce 5 units of A and 9 units of B. 4

Because of prior contract commitments, the refinery must produce at least 500 units of A and at least 300 units of B for the next month. It has 1,500 units of crude Q, 1,900 units of crude P and 1,000 units of crude R. For each unit of A, refinery receives Rs. 60 while for each unit of B, it receives Rs. 90.

Formulate the problem as linear programming model so as to maximise the revenue.

- (c) Explain the term 'degeneracy' in a transportation problem. 4
5. (a) B Ltd. makes industrial power drills which is made by the use of two components A (electrical and mechanical components and B (plastic housing). The following table shows the cost of plastic housing separately from the cost of the electrical and mechanical components : 8

| | A Electrical and Mechanical Components (Rs.) | B Plastic Housing (Rs.) | A & B Industrial Drills (Rs.) |
|----------------------------------|--|----------------------------------|--|
| Sales 1,00,000 units @ Rs. 100 | | | 1,00,00,000 |
| Variable costs : | | | |
| Direct materials | 44,00,000 | 5,00,000 | 49,00,000 |
| Direct labour | 4,00,000 | 3,00,000 | 7,00,000 |
| Variable factory overhead | 1,00,000 | 2,00,000 | 3,00,000 |
| Other variable costs | 1,00,000 | — | 1,00,000 |
| Sales commissions @ 10% of sales | 10,00,000 | — | 10,00,000 |
| Total variable costs | 60,00,000 | 10,00,000 | 70,00,000 |
| Contribution | — | — | 30,00,000 |
| Total fixed costs | 22,20,000 | 4,80,000 | 27,00,000 |
| Operating income | | | <u>3,00,000</u> |

Answer the following questions independently :

- (i) During the year, a prospective customer offered Rs. 82,000 for 1,000 drills. The drills would be manufactured in addition to the 1,00,000 units sold. B Ltd would pay the regular sales commission rate on the 1,000 drills. The Chairman rejected the order because "it was below our costs". Calculate operating income if B Ltd. accepts the offer.
- (ii) A supplier offers to manufacture the yearly supply of 1,00,000 units plastic housing components for Rs. 13.50 each. Assume that B Ltd would avoid Rs. 3,50,000 of the costs assigned to plastic housing if it purchases. Calculate operating income if B Ltd. decides to purchase the plastic housing from the supplier.
- (iii) Assuming that B Ltd. could purchase 1,20,000 units (plastic housing components) for Rs. 13.50 each and use the vacated plant capacity for the manufacture of delux version of drill of 20,000 units (and sell them for Rs. 130 each in addition to the sales of the 1,00,000 regular units) at a variable cost of Rs. 90 each, exclusive of housings and exclusive of the 10% sales commission. All the fixed costs pertaining to the plastic housing would continue, because these costs are related to the manufacturing facilities primarily used. Calculate operating income of B Ltd. purchases the plastic housings and manufacture the delux version of drills.
- (b) LMV Limited manufactures product Z in departments A and B which also manufacture other products using same plant and machinery. The information of product Z is as follows :

| Items | Department A (Rs.) | Department B (Rs.) |
|---|--------------------|--------------------|
| Direct material per unit | 30 | 25 |
| Direct labour per unit (Rs. 10 per hour) | 30 | 40 |
| Overhead rates : | | |
| Fixed | 8 per hour | 4 per hour |
| Variable | 6 per hour | 3 per hour |
| Value of Plant and Machinery | 25 lakhs | 15 lakhs |

Overheads are recovered on the basis of direct labour hours. Variable selling and distribution overheads relating to product Z are amounting to Rs. 30,000 per month. The product requires a working capital of Rs. 4,00,000 at the target volume of 1,500 units per month occupying 30 per cent of practical capacity.

You are required :

- (i) To calculate the price of product Z to yield a contribution to cover 21 per cent rate of return on investment.
- (ii) Set the minimum selling price of the product if (1) the product is well established in the market; (2) the product is first time launched in the market.
- (c) "Sunk costs are irrelevant in decision-making, but irrelevant costs are not sunk cost." Explain with examples.