

Total No. of Questions : 12]

SEAT No. :

P1060

[Total No. of Pages : 4

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B.E. (Mechanical)

c-QUANTITATIVE AND DECISION MAKING TECHNIQUES

(Semester-I) (2008 Course) (402045) (Elective-II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *All the questions are compulsory.*
- 2) *Two separate answer books are used for Section-I and Section-II.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is permitted.*
- 5) *Assume suitable data, if necessary.*

SECTION-I

Q1) a) Explain: [6]

- i) Pure and Mixed strategies.
- ii) Dominance rule.

b) Reduce the following game by dominance and find the game value.[10]

Player B

| | | I | II | III | IV |
|----------|-----|---|----|-----|----|
| Player A | I | 3 | 2 | 4 | 0 |
| | II | 3 | 4 | 2 | 4 |
| | III | 4 | 2 | 4 | 0 |
| | IV | 0 | 4 | 0 | 8 |

OR

Q2) a) What are various Game theory Methods? Explain any one method in detail. [6]

b) Explain the steps in Decision-Making. [6]

c) Define: [4]

- i) Operations Research.
- ii) Minimax and Maximin principle.

P.T.O.

- Q3) a)** Explain Hungarian Method of solving assignment problem. [6]
b) Five different machines can do any of five required components with different profit resulting from each assignment as shown in table below. Find out maximum profit possible through optimum assignment. [12]

| | | Machine | | | | |
|-----------|---|---------|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 |
| Component | A | 30 | 37 | 40 | 28 | 40 |
| | B | 40 | 24 | 27 | 21 | 36 |
| | C | 40 | 32 | 33 | 30 | 35 |
| | D | 25 | 38 | 40 | 36 | 36 |
| | E | 29 | 62 | 41 | 34 | 39 |

OR

- Q4) a)** Solve the following cost minimizing transportation problem. [12]

| | | I | II | III | IV | V | VI | Available |
|----------|---|----|----|-----|----|----|----|-----------|
| Required | 1 | 2 | 1 | 3 | 3 | 2 | 5 | 50 |
| | 2 | 3 | 2 | 2 | 4 | 3 | 4 | 40 |
| | 3 | 3 | 5 | 4 | 2 | 4 | 1 | 60 |
| | 4 | 4 | 2 | 2 | 1 | 2 | 2 | 30 |
| | | 30 | 50 | 20 | 40 | 30 | 10 | 180 |

- b)** Discuss travelling salesman problem as an assignment problem with Sub-optimal solution. [6]

- Q5) a)** Discuss the concept of sensitivity analysis in LPP. [6]

- b)** Solve LPP by Simplex Method. [10]

Maximize $Z = 3X_1 + 4X_2$

Subject to $X_1 + X_2 \leq 450$

$2X_1 + X_2 \leq 600$

Where $X_1, X_2 \geq 0$.

OR

- Q6) a)** Define Linear Programming. Give applications of Linear Programming. [6]

- b)** A firm manufactures two products P_1, P_2 on which the profits earned are Rs. 5 and Rs. 8 respectively. Each product is prepared on two machines M_1 and M_2 . The machine time required for these products on the two machines and their availability is as shown below.

| | Product P ₁ | Product P ₂ | Availability of machines (mins.) per day |
|------------------------|------------------------|------------------------|--|
| Machine M ₁ | 2 | 1 | 400 |
| Machine M ₂ | 4 | 1 | 600 |

Find the number of units of products P₁ and P₂ to be manufactured per day to get maximum profits. [10]

SECTION-II

Q7) a) Define: [8]

- i) Queue Length.
- ii) Service in priority.
- iii) Traffic intensity.
- iv) Service channels.

b) A fast moving item has a demand of 18000 units/year. The cost of one procurement is Rs. 50 and inventory carrying or holding cost is Rs. 1.20 per unit per year. It is assumed that supply is received as soon as the order is placed and no shortage or stock permitted. Cost of one unit is Rs. 8.

Determine:

- i) EOQ.
- ii) Number of orders/year.
- iii) Total cost per year. [8]

OR

Q8) a) Explain Single Channel Poisson Arrival with exponential service, infinite population method. [8]

b) Derive the EOQ relation with instantaneous stock replenishment. [8]

Q9) a) Give merits and demerits of Average (Accounting) Rate of Return method. [4]

b) A firm is thinking of replacing a particular machine whose cost price is Rs. 12,200. The scrap price of this machine is only Rs. 200. The maintenance cost are found to be as follows.

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------------|-----|-----|-----|------|------|------|------|------|
| Maintenance cost (Rs.) | 220 | 500 | 800 | 1200 | 1800 | 2500 | 3200 | 4000 |

Determine when the firm should get the machine replaced. [12]

OR

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Q10)a) Explain Break Even Analysis and Margin of safety with neat sketch. [6]

b) Following figures are related to toy manufacturing company.

Variable cost per unit = 8 Rs.

Sell price per unit = 14 Rs.

Total units sold = 50,000

Fixed cost = 12,000 Rs.

Calculate:

i) P/V ratio,

ii) B.E.P. in units,

iii) B.E.P. in sales,

iv) Margin of safety,

v) Total profit.

[10]

Q11)a) Explain different types of floats. [6]

b) The following table lists the jobs of a network along with their time estimates: [12]

i) Draw the project network.

ii) Calculate the length and variance of the critical path.

iii) What is approximate probability that the job as per critical path will be completed in 24 hours?

| Activity | To | Tm | Tp |
|----------|----|----|----|
| 1-2 | 1 | 3 | 5 |
| 2-3 | 2 | 5 | 6 |
| 2-4 | 4 | 6 | 7 |
| 2-5 | 8 | 10 | 12 |
| 3-5 | 0 | 0 | 0 |
| 3-6 | 4 | 8 | 9 |
| 4-7 | 5 | 7 | 14 |
| 5-7 | 7 | 10 | 16 |
| 6-7 | 0 | 0 | 0 |
| 6-8 | 6 | 9 | 12 |
| 7-9 | 1 | 3 | 7 |
| 8-9 | 3 | 5 | 7 |

OR

Q12)a) Write difference between PERT and CPM. [6]

b) Find critical path, TF, FF, IF. [12]

| Activity | 1-2 | 1-3 | 2-4 | 2-6 | 3-4 | 4-5 | 4-6 | 5-7 | 6-7 | 7-8 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| NT | 10 | 11 | 13 | 14 | 10 | 7 | 17 | 13 | 9 | 1 |

