



Printed Pages : 4

TMT011

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0422

Roll No.

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

B.Tech

(SEM VII) ODD SEMESTER THEORY EXAMINATION 2009-10 OPERATION RESEARCH

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (i) Attempt all questions.
 - (ii) All question carry equal marks.
 - (iii) Be precise in your answer.

1 Attempt any two of the following : 10×2

- (a) An animal feed company must produce 200 kg of a mixture consisting of ingredient X_1 and X_2 daily. X_1 costs Rs. 3 per kg and X_2 cost Rs. 8 per kg. No more than 80 kg of X_1 can be used and at least 60 kg of X_2 must be used. Find how much of each should be used if the company wants to minimize cost. Use graphical method to solve the problem.

- (b) Solve the following LP problem : 10

$$\text{Min. } Z = x_1 - 2x_2 - 3x_3$$

$$\text{subject to } -2x_1 + x_2 + 2x_3 = 2$$

$$2x_1 + 3x_2 + 2x_3 = 1$$

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



- (c) (i) Write down five advantages of duality in linear programming. 5
(ii) Write a short note on sensitivity analysis. 5

2 Attempt any **one** of the following : 20

- (a) (i) A company has four factories F_1, F_2, F_3 and F_4 manufacturing the same product. The production cost, raw material cost, Transportation costs, sales price, requirements and supply is given below : 14

F_3 and F_4 manufacturing the same product. The production cost, raw material cost, Transportation costs, sales price, requirements and supply is given below :

| | F_1 | F_2 | F_3 | F_4 | | |
|-------------------|-------|-------|-------|-------|-----------------|-------------|
| Production cost | 15 | 18 | 14 | 13 | | |
| Raw mat. cost | 10 | 9 | 12 | 9 | Sale price/unit | Requirement |
| Transport cost to | | | | | | |
| S_1 | 3 | 9 | 5 | 4 | 34 | 80 |
| S_2 | 1 | 7 | 4 | 5 | 32 | 120 |
| S_3 | 5 | 8 | 3 | 6 | 31 | 150 |
| Supply | 10 | 150 | 50 | 100 | | |

Determine the most profitable production and distribution schedule and corresponding profit. The deficit in production if any should be taken to yield zero profit.

- (ii) State Bellman's Principle of optimality and explain by an example how it can be used to solve a multistage decision problem. 6
(b) (i) Explain how to modify an effectiveness matrix in an assignment problem if a particular assignment is prohibited. 6

- (ii) A construction contractor has four construction projects underway and wants to minimize the time required to complete all projects. The following table gives the estimated time required to complete the project for a specified number of foreman assigned to the project : 14

| Project | No. of foremen | | Assigned |
|---------|----------------|----|----------|
| | 1 | 2 | |
| A | 15 | 13 | 12 |
| B | 17 | 15 | 13 |
| C | 19 | 18 | 17 |
| D | 21 | 18 | 18 |

Find the number of foremen to be assigned to each project and the minimum time to complete all of the projects.

3 Attempt any **two** of the following : 10×2

- (a) Solve the following game :

| | | Player B | | |
|----------|-----|----------|----|-----|
| | | I | II | III |
| Player A | I | 1 | 7 | 2 |
| | II | 6 | 2 | 7 |
| | III | 5 | 2 | 6 |

- (b) What do you understand by decision tree ? Explain clearly the steps in decision tree analysis with suitable example.
(c) Discuss the difference between decision making under uncertainty and risk.

4 Attempt any **two** of the following : 10×2

- (a) Describe the basic characteristics of an inventory system and also distinguish between deterministic and stochastic models.
- (b) The demand for a certain item is 16 units per period. Unsatisfied demand causes a shortage cost of Re. 0.75 per unit per short period. The cost of initiating purchasing action is Re.1 per purchase and the holding cost is 15% of average valuation per period. Item cost is Rs. 8.00 per unit. (Assume the shortage are being back ordered at the above mentioned cost). Find the minimum cost of purchase quantity.
- (c) Discuss in brief (i) Reorder level and (ii) safety stock.

5 Attempt any **two** of the following : 10×2

- (a) What are the advantages and limitations of simulation models ?
- (b) What is a queueing problem ? Explain some of the basic characteristics of queueing system.
- (c) What are random numbers ? Why are random number useful in simulation models ?

