

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME Semester –III Examination Dec. - 2011**

**Subject code: 731402****Date: 08/12/2011****Subject Name: Operation Research in Construction****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Discuss and describes the role of linear programming in managerial decision making, along with its pros-&-cons. **07**
- (b)** Enlist & explain types of decision making environment. **07**

- Q.2 (a)** Discuss applications and scope of operation research with examples. **07**
- (b)** (i) What is the significance of utility as a basis of decision making? **03**
- (ii) Decision maker has to choose between two investments X & Y which are calculated to give net profit of Rs. 1600 And Rs.1200 respectively with probabilities subjectively estimated at 0.60 & 0.75. Assume the decision maker's utility function reveals that utilities for Rs. 1600 & Rs. 1200 are 50 & 45 respectively. Determine the best choice on the basis of expected utility value. **04**

**OR**

- (b)** A person wants to invest in two independent investment schemes X & Y, but he can undertake only one at a time due to certain constraints. He can select X first and then stop, or if X is not successful then take Y or vice-versa. The probability of success of X is 0.7, while of Y is 0.30. investment in both schemes require an initial capital outlay of Rs.100000 and both return nothing if the venture is not successful. Successful completion of X will return Rs. 200000 (over cost) and successful completion of Y will return Rs. 240000 (over cost). Draw decision tree and determine the best strategy. **07**
- Q.3 (a)** Explain BAYESIAN rule . give step by step procedure for prior and posterior analysis. **07**
- (b)** Following is a payoff (rupees) table. **07**

| strategy | event |       |
|----------|-------|-------|
|          | $E_1$ | $E_2$ |
| $A_1$    | 40    | 60    |
| $A_2$    | 10    | -20   |
| $A_3$    | -40   | 150   |

Choose a suitable strategy using each of the following criteria.

1. Maximin. 2. Maximax. 3. Lplace. 4. Minimax regret.

**OR**

- Q.3 (a)** Explain expected value of sample information.(EVSI) **07**
- How is it calculated? Give a measure of efficiency of EVSI

- (b) In a small town there are only two builders A & B that handle housing society construction. The total numbers of customers is equally divided between the two, because price and quality of bot are equal. Assume that a gain of customer by A is loss to B and vice-versa. Both have planned to offer festival package during the month of October. Advertising is done by both through a local newspaper, banners and local television channels. With the help of advertising firm builder A constructed game matrix showing gain or loss of customers. 07

| Strategy of A | Strategy of B |         |             |
|---------------|---------------|---------|-------------|
|               | News paper    | Banners | TV channels |
| Newspaper     | 30            | 40      | -80         |
| Banners       | 0             | 15      | -20         |
| TV channels   | 90            | 20      | 50          |

Determine optimal strategy and worth of such strategies for both builders A &B..

- Q.4 (a)** With the help of suitable sketches, define convex, non-convex and infeasible regions in relation to the graphical solution of a linear programming problem 04
- (b)** Mr. Anil Nick's company manufactures two kinds of machines, each requiring a different manufacturing technique. The deluxe machine requires 18 hours of labour, 9 hours of testing & yield a profit of Rs 400. The standard machine requires 3 hours of labour, 4 hours of testing & yield a profit of Rs 200. There are 800 hours of labour and 600 hours of testing available each month. A marketing forecast has shown the monthly demand for the standard machine to be not more than 150. The management wants to know the numbers of each model to produce monthly that will maximize total profit. Formulate and solve this liner programming problem using any method. 10

**OR**

- Q.4** Solve the following LPP using simplex method: 14

$$\begin{aligned}
 &\text{Maximize } Z = 50x_1 + 110x_2 + 120x_3, \\
 &\text{Subject to } 3x_1 + 3x_2 + 5x_3 \leq 100, \\
 &\quad \quad \quad x_1 + 3x_2 + 4x_3 \leq 80, \\
 &\quad \quad \quad 2x_1 + 4x_2 + 3x_3 \leq 60, \\
 &\quad \quad \quad x_1, x_2, x_3 \geq 0.
 \end{aligned}$$

Give your comments on the solution achieved. Is there any alternate solution to this problem?

- Q.5 (a)** Explain the philosophy of 'Dual of LPP' and discuss advantages of use of duality in managerial decisions. 07
- (b)** Write the 'Dual' of the LPP given in '(OR)Q:4'. Convert the dual in simplex format to find its solution using simplex method. Also write the initial tableau for the same. 07

**OR**

- Q.5 (a)** Answer followings: 07
1. What is shadow price? How does the concept of sensitivity analysis be useful in management?
  2. Explain Infeasibility and unboundedness in LPP.

- (b)** Solve following transportation problem. Obtain the initial solution by NW corner rule. 07

| Source | Destination |    |    |    | Supply |
|--------|-------------|----|----|----|--------|
|        | 1           | 2  | 3  | 4  |        |
| A      | 7           | 3  | 8  | 6  | 60     |
| B      | 4           | 2  | 5  | 10 | 100    |
| C      | 2           | 6  | 5  | 1  | 40     |
| Demand | 20          | 50 | 50 | 80 | 200    |

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