Sr. No. of Question Paper : 287   C   **Roll No**.............

Unique Paper Code   : 236163

Name of the Paper   : ORC-I : Operational Research Concurrent, Operational Research

Name of the Course   : B.Sc. (Mathematical Sciences)

Semester   : I

Duration   : 3 Hours

Maximum Marks   : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt any **five** Questions.

3. **All** questions carry equal marks.

1. (a) What is Operational Research ? Explain briefly the applications of Operational Research.   (8)

   (b) What are the various components of ordering/setup cost, holding cost and stockout cost in an inventory system for an organisation ?   (7)

2. (a) Consider a system which keeps an inventory of an item with the annual demand of 20000 units/year, inventory carrying charge of 25%, unit cost Rs.3/unit, ordering/setup cost of Rs. 16 per order, shortage cost is Rs. 3 per unit/year and lead time is 1 year. Find the optimal order quantity, reorder level and minimum average yearly cost.   (9)

   (b) Define the following :

      (i) Slack and Surplus variable

      (ii) Artificial variable

      (iii) Basic feasible solution   (6)

3. Find the expression for EOQ for the generalised economic lot size model. Usual notations may be used. (15)

4. (a) What is linear programming problem ? What are its limitations ? (6)

   (b) A diet for a sick person must contain at least 4,000 units of vitamins, 50 units of minerals and 1,400 calories. Two foods A and B are available at cost of Rs. 4 and Rs. 3 per unit, respectively. If one unit of A contains 200 units of vitamins, 1 unit mineral and 40 calories and one unit of food B contains 100 units of vitamins, 2 units of minerals and 40 calories, find by graphical method what combination of food be used to have least cost ? (9)

5. (a) Show that the set of all convex combinations of a finite number of points of $S \subset R^n$ is a convex set. (7)

   (b) Write the dual of the following Linear Programming problem;

   Min $Z_x = x_1 + x_2 + x_3$

   Subject to the constraints;

   $x_1 - 3x_2 + 4x_3 = 5$

   $x_1 - 2x_2 \leq 3$

   $2x_2 - x_3 \geq 4$, $x_1, x_2 \geq 0$ and x_3 is unrestricted. (8)

6. Use two-phase simplex method to solve the following Linear programming problem;

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

   Subject to constraints;

   $2x_1 + x_2 - 6x_3 = 20$

   $6x_1 + 5x_2 + 10x_3 \leq 76$

   $8x_1 - 3x_2 + 6x_3 \leq 50$, $x_1, x_2, x_3 \geq 0$ (15)

7. (a) Show that the following system of linear equations has a degenerate solution;

   $2x_1 + x_2 - x_3 = 2$

   $3x_1 + 2x_2 + x_3 = 3$ (8)

   (b) Give the economic interpretation of duality. (7)