This question paper contains 4 printed pages.

5184–G *Your Roll No.* .....

B.Sc. Prog. / Sem. I B

MATHEMATICAL SCIENCES

Paper ORC-I : Operational Research Concurrent – I

(Admissions of 2011 and onwards)

Time : 3 hours *Maximum Marks* : 75

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

Attempt any five questions.

1. (*a*) Define Operational Research as a decision making science. What are the advantages and disadvantages of Operational Research approach? 7·5

   (*b*) A box manufacturer makes small and large boxes from a piece of cardboard. The large box requires 4 sq ft and small box 3 sq ft per box. He is required to make at least 3 large boxes and at least twice as many small boxes. If 60 sq ft of cardboard is available and profit is Rs. 3 on large and Rs. 2 on small, maximize profit using graphical method. 7.5

2. (*a*) Define the following terms:

   (*i*) Extreme point

   (*ii*) Basic feasible solution. 3

P. T. O.

(*b*) Determine all possible basic feasible solutions for the following set of equations:

$$4x_1+2x_2+x_3=7$$

$$-x_1+4x_2+2x_3=14.$$ 5

(*c*) Define a convex set and examine the convexity of the set:

$$S=\{(x, y) : 3x^2+2y^2\leq 6\}.$$ 7

3. (*a*) With the help of simplex method verify whether the following problem is inconsistent or unbounded:

$$\text{Min} \quad z=3x_1+2x_2$$

$$\text{subject to} \quad 2x_1+x_2\geq 2$$

$$3x_1+4x_2\geq 12$$

$$x_1, x_2\geq 0.$$ 7·5

(*b*) Write the dual of the following linear programming problem:

$$\text{Min} \quad z=3x_1+4x_2+x_3$$

$$\text{subject to} \quad 2x_1+3x_2-x_3\geq 1$$

$$x_2+x_3=10$$

$$x_1+4x_2+7x_3\leq 92$$

x_1 is unrestricted, $x_2, x_3\geq 0$

and x_3 is unrestricted in sign. 5

(*c*) What is an infeasible solution? How is this condition recognized in the graphical method? 2·5

4. (*a*) What is Inventory Control? Why is it kept in an organization? Explain the different costs involved in the Inventory problems. 8

(*b*) Find out economic order quantity and reorder level when demand is deterministic and instantaneous at 800 units/year, unit cost is Rs. 10/unit, Inventory carrying cost is Rs. 3/unit/time. The ordering cost is Rs. 30/order. The lead time is 14 days. 7

5. (*a*) Formulate an optimal order policy when demand is finite and deterministic, shortages are allowed and fully backlogged, production is instantaneous. 8

(*b*) Describe an all unit discount model in Inventory model. Find out the optimal order quantity when:

Demand — 1000 units/year

Ordering cost— Rs. 8/order

Inventory carrying charge is 20%.

Price Breaks	*Unit cost*
$0 \leq Q < 200$	c_0=Rs. 1·0
$200 \leq Q$	c_1=Rs. 0·95

7

P. T. O.