3650/R20 **MAY 2009**

OPTIMIZATION TECHNIQUES

(For those who joined in July 2006 and after)

Time : Three hours Maximum : 75 marks

PART A — (7 × 5 = 35 marks)

Answer ALL questions.

1. (a) What are the phases of Operations research.?

Or

(b) A company produces both interior and exterior house paints. Two basic raw materials R_1 and R_2 are used to manufacture the paints. The maximum availability of R_1 is 6 tons a day, that of R_2 is 8 tons a day. The daily requirements of the raw materials per ton of interior and exterior paints are tabulated below :

Tons of raw material per Ton of paint

	Exterior	Interior	Maximum availability
R_1	1	3	12
R_2	4	2	10
Price per ton	Rs. 3,000	Rs. 4,000	

Formulate the above as an LPP.

2. (a) Explain north west corner rule.

Or

(b) Explain any two procedures used to solve assignment problem.

3. (a) Find the dual of maximize

$$z = 5x_1 + 4x_2 - 3x_3$$

Subject to
$$2x_1 + x_2 - x_3 \le 10$$
$$-x_1 + 2x_2 + 3x_3 \le 8$$
$$x_1, x_2, x_3 \ge 0.$$

Or

(b) Explain branch and bound method.

4. (a) Write the mathematical model for an assignment problem.

Or

(b) Explain stochastic processes with suitable example.

5. (a) Explain arrival characteristics.

Or

(b) In (M/M/l) : (∞/FIFO) queuing model derive the formula for the average waiting time of a customer in the queue.

6. (a) In $(M/M/1:GD/\infty/\infty)$, prove that the probability distribution that there are n customers in the system is geometric.

Or

(b) Explain Kendall's notation for representing queuing models.

7. (a) State and prove any two properties of Z-transforms.

Or

(b) With usual notation, prove that

$$Z(p_{n+1}) = \frac{1}{z}\{p(z) - p_0\}$$

PART B — (4 × 10 = 40 marks)

8. (a) Solve the following LPP using graphical procedure :

Maximize $z = 3x_1 + 2x_2$

Subject to $2x_1 + 3x_2 \leq 100$

$4x_1 + 2x_2 \leq 120$

$x_1, x_2 \geq 0.$

Or

(b) Solve the following LPP using simplex method :

Maximise $z = 3x_1 + 5x_2$

Subject to $3x_1 + 2x_2 \leq 18$

$x_1 \leq 4$

$x_2 \leq 6,$

$x_1, x_2 \geq 0.$

9. (a) Solve the following integer Linear programming problem :

Maximize $z = 4x_1 + x_2$

Subject to $4x_1 + 2x_2 \leq 7$

$3x_1 + 5x_2 \leq 15.$

x_1, x_2 are non-negative integers.

Or

(b) Obtain an optimal solution of the assignment problem :

	A	B	C	D
1	6	5	5	2
2	3	4	5	7
3	4	3	5	1
4	5	4	2	6

[P.T.O.]