Reg. No. .....

(3 pages)

K 5109

Name .....

FINAL YEAR B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2005

Part III—Group I—Mathematics

Paper VIII—Elective—OPERATIONS RESEARCH

Time : Three Hours

Maximum : 65 Marks

Not more than 13 *marks will be awarded from each unit.*

Unit I

1. Explain the nature of mathematical models used in Operations Research and mention different types of solutions to such models. (6 marks)

2. Show that the set of all feasible solutions to an L.P.P. is a closed convex set. (4 marks)

3. Define a hyperplane and show that a hyperplane is a convex set. (4 marks)

4. Solve the following L.P.P. geometrically :—

$$\text{Maximize} \quad Z = 15x_1 + 10x_2$$
$$\text{subject to} \quad 3x_1 + 2x_2 \leq 80$$
$$2x_1 + 3x_2 \leq 70$$
$$x_1 \geq 0, x_2 \geq 0.$$

(6 marks)

Unit II

5. Write a short note on the Simplex method. (6 marks)

6. Solve the L.P.P. :

$$\text{Maximize} \quad Z = 6x_1 - 2x_2$$
$$\text{subject to} \quad 2x_1 - x_2 \leq 2$$
$$x_1 \leq 4, x_1, x_2 \geq 0.$$

(6 marks)

7. Solve dual of the following problem by simplex method :—

$$\text{Maximize} \quad Z = 2x_1 + 3x_2 + 5x_3$$
$$\text{subject to} \quad x_1 + x_2 + x_3 \leq 7$$
$$x_1 + 2x_2 + 2x_3 \leq 13$$
$$3x_1 - x_2 + x_3 \leq 5$$
$$x_1, x_2, x_3 \geq 0.$$

(8 marks)

Turn over

Unit III

8. Write a short note on degeneracy in transportation problems. (6 marks)

9. Obtain an initial basic feasible solution to the following transportation problem by Vogel's approximation method :—

		Stores				
		s_1	s_2	s_3	s_4	Availability
Ware house	A	5	1	3	3	34
	B	3	3	5	4	15
	C	6	4	4	3	12
	D	4	1	4	2	19
		21	25	17	17	80

(7 marks)

10. Solve the following assignment problem :—

	1	2	3	4
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

(7 marks)

Unit IV

11. Explain the theory of dominance in the solution of rectangular games. (4 marks)

12. The pay-off matrix of a game is given. Find the solution of the game to A and B. Also find the value of the game.

		B				
		I	II	III	IV	V
A	I	−2	0	0	5	3
	II	3	2	1	2	2
	III	−4	−3	0	−2	6
	IV	5	3	−4	2	−6

(5 marks)

13. Use Branch and Bound technique to solve the following problem :—

Maximize $Z = 7x_1 + 9x_2$

subject to $-x_1 + 3x_2 \leq 6$

$7x_1 + x_2 \leq 35$

$0 \leq x_1, x_2 \leq 7$ are integers.

(6 marks)

14. Find the optimum integer solution to the following L.P.P. by Gomory technique :

Maximize $Z = x_1 + 2x_2$

subject to $x_1 + x_2 \leq 7$

$2x_1 \leq 11$

$2x_2 \leq 7$

$x_1, x_2 \geq 0$ and are integers.

(5 marks)

Unit V

15. What do you mean by group replacement ? How does it differ from individual replacement ?

(6 marks)

16. Find the optimal replacement policy for the following problem. The cost of a machine is Rs. 5,000. The running cost and resale value are given below :—

Year	:	1	2	3	4	5	6	7	8
Running cost	:	1500	1600	1800	2100	2500	2900	3400	4000
Resale value	:	3500	2500	1700	1200	800	500	300	200

(7 marks)

17. There are five jobs, each of which must go through machines A, B and C in the order ABC. Processing times are given below :

Jobs	:	1	2	3	4	5
Machine A	:	8	10	6	7	11
Machine B	:	5	6	2	3	4
Machine C	:	4	9	8	6	5

Determine a sequence for the jobs that will minimize the elapsed time.

(7 marks)