



(Pages 3)

Name

Subject to constraints

in large towns

Spend two days in large

## northern familiary or Trail SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE **EXAMINATION, JUNE 2008**

## ME 04 605—OPERATIONS RESEARCH

(2004 admissions)

Time: Three Hours

Maximum: 100 Marks

## Part A

Answer all questions.

1. (a) Test for the consistency of the system of equations:

$$x + 2y - 3z = 3$$
;  $2x + y + 4z = 1$ ;  $5x + 4y + 5z = 2$ 

and find the solution.

- 文十文十九 (b) Prove that the closed half spaces  $H_1 = \{x/c_x \ge z\}$  and  $H_2 = \{x/c_x \le z\}$  are convex sets.
- (c) Explain slack and surplus variables. What is the test of optimality in the simplex method?
- (d) What are the limitations of LPP? How to resolve degeneracy in LPP?
- (e) Define the following:
- (a) A Railway station has only one loading buy manager from (i) Zero sum game; (ii) Two person zero sum game.

When do you say a game is stable? The stable of the stable

The train waiting charges are Rs. 20 Her Eddin der have been been been been been both or have bore be assumed that the work capacity is proportional to the number of crevis. and state the rule of (f) Find the Dominating row and Dominating colum in ny hodipha na mandra da managana

dominance.

- A water to the Bullianian . When the of the place and in allowing (g) What is called as queuing Theory? Write a brief note on waiting-line costs and measures of a waiting-line system performance. Strategies... elle rites di veh
- (h) Differentiate Dynamic programme with linear programming and give any three applications of dynamic programming.  $(8 \times 5 = 40 \text{ marks})$ Campaign two days

## Part B

2. (a) Test the consistency of the system of equations:

Fest the consistency of the system 
$$x + 2y + z = 3$$
;  $2x + 3y + 2z = 5$ ;  $3x - 5y + 5z = 2$ ;  $3x + 9y - z = 4$ .

(b) Prove that  $X_1 = (2, -1, 4) X_2 = (4, 0, 12)$  and  $X_3 (0, 1, 2)$  are linearly dependent. Express  $X_1$  as a linear combination of  $X_2$  and  $X_3$ . Turn over removed and a life

EXAMINATION. MINE

3. (a) Solve the following LPP by graphical method: Maximize  $Z = 3x_1 + 5x_2$ 

Maximize 
$$Z = 3x_1 + 5x_2$$

Subject to the constraints

$$x_1 + 2x_2 \leq 2000$$

$$2x_1 + x_2 \leq 2000$$

$$x_2 \leq 600 \text{ and } x_1, x_2 \geq 0$$

(b) Use the simplex method to solve the LPP (a) That for the consistency of the system of equati-

Minimize 
$$Z = -x_1 + x_2 - 3x_3$$

rath gard

Subject to constraints

x + 2y - 3z = 3; 25 + y + 42 = 1; 3x + 4y + 5;

$$-2x_1 + x_3 \ge -2$$
(e) Hard state and surplus variables. What is the test of open above with the state to the state of th

What are the limitations of LPP? How its resolve where the limitations of LPP? How its resolve where the limitations of LPP? How its resolve where the limitations of 
$$x_1, x_2, x_3 \le 0$$

(a) A Railway station has only one loading bay managed by a maximum of three person crew. Studies Indicate that average arrival rate of trains for unloading is 4 hour and average service rate is 6 trains/hour. Examine the appropriateness of the number of crew in the system. The train waiting charges are Rs. 20 per hour and the load crew costs Rs. 6 per hour. It can be assumed that the work capacity is proportional to the number of crews.

(f) Find the Dominating row and Dominating tolding in and elect (5 45 to 1 (b) In an election campaign, the strategic adopted by the ruling and opposition party along with pay-offs (ruling party's % share in votes polled) are given below:

Ruling Party's Strategies	Campaign one day in each city		Campaign two days in large towns	Spend two days or large rural areas	
Campaign are day in each city	•••	55		sa alaan <b>35</b> ta	
Campaign two days in large towns	•••	70	70 la acateva edita varia	<b>7.6</b> Test the consis	
Spend two days in large rural sectors		75	55 + 55	65	

Assume a zero sum game. Find optimum strategies for both parties and expected pay-off to ruling party. James Combination of X, see V

5. (a) Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table:-

			12.8	Job	74.4.7		100
		I	) II	Ш	IV	v	The state of
	A	2	9	2 7 5 7	7	1	( (Sp.)
	В	6	8	7	6	1	
Man	C	4	6	5	3	11	
	D	4	2	7.5	0e <b>3</b> a	1	
	E	5	3	9	3	1	



Find the assignment of men to jobs that will minimise the total time taken.

Or

(b) Use dynamic programme method to solve maximize  $Z = Y_1 Y_2 Y_3$  subject to the constraints:

$$Y_1 + Y_2 + Y_3 = 6$$
. What the test of optimality in the simplex method?  
 $Y_1, Y_2, Y_3 \ge 0$  frow so a solve degeneracy in LPP?

 $(4 \times 15 = 60 \text{ marks})$