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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.

   (b) Prove that the closed half spaces $H_1 = \{ x/c_x \geq z \}$ and $H_2 = \{ x/c_x \leq z \}$ 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 :

   (i) Zero sum game ; (ii) Two person zero sum game.

   When do you say a game is stable ?

   (f) Find the Dominating row and Dominating colum in $\begin{vmatrix} 5 & 4 & 2 \\ -2 & 1 & -1 \\ -4 & 8 & 5 \end{vmatrix}$ and state the rule of dominance.

   (g) What is called as queuing Theory ? Write a brief note on waiting-line costs and measures of a waiting-line system performance.

   (h) Differentiate Dynamic programme with linear programming and give any *three* applications of dynamic programming.

   $(8 \times 5 = 40 \text{ marks})$

Part B

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

   $x + 2y + z = 3$; $2x + 3y + 2z = 5$; $3x - 5y + 5z = 2$; $3x + 9y - z = 4$.

   Or

   (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

3. (a) Solve the following LPP by graphical method :

Maximize $Z = 3x_1 + 5x_2$

Subject to the constraints

$$x_1 + 2x_2 \leq 2000$$

$$2x_1 + x_2 \leq 2000$$

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

Or

(b) Use the simplex method to solve the LPP :

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

Subject to constraints

$$x_1 + x_2 + x_3 \leq 10$$

$$-2x_1 + x_3 \geq -2$$

$$2x_1 - 2x_2 + 3x_3 \leq 0$$

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

4. (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.

Or

(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 on large rural areas
Campaign are day in each city ...	55	40	35
Campaign two days in large towns ...	70	70	55
Spend two days in large rural sectors ...	75	55	65

Assume a zero sum game. Find optimum strategies for both parties and expected pay-off to ruling party.

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 :—

	Job				
	I	II	III	IV	V
A	2	9	2	7	1
B	6	8	7	6	1
Man C	4	6	5	3	1
D	4	2	7	3	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 :

$$Y_1 + Y_2 + Y_3 = 6$$
$$Y_1, Y_2, Y_3 \geq 0$$

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