

C 14745

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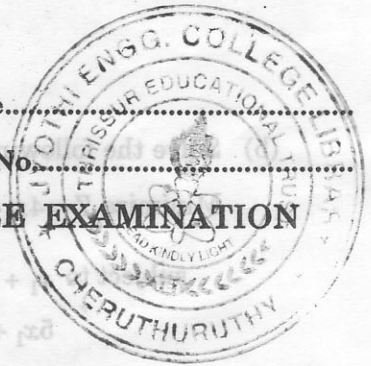
Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
DECEMBER 2010

ME 04 605—OPERATIONS RESEARCH

(2004 admissions)



Time : Three Hours

Maximum : 100 Marks

Answer all questions.

I. (a) Find the rank of the matrix $\begin{pmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{pmatrix}$.

- (b) Show that the vectors (1, 0, 4, 3) (3, 2, -6, -1) and (2, 1, -1, 1) are linearly dependent.
- (c) Explain the followings with an example. Slack variable, surplus variable, artificial variable.
- (d) State the method of determining the incoming variable and outgoing variation in simplex iteration process.
- (e) Explain degeneracy in linear programming problems.
- (f) State the steps in solving game theory problem using dominance strategy.
- (g) Explain the characteristics of (i) Poisson arrival process ; (ii) Erlangian service times.
- (h) Explain briefly Bellman's principle of optimality in dynamic programming.

(8 × 5 = 40 marks)

II. (a) Find the value of K for which the equations $x - 2ky + z = -2$, $kx - 2y + z = 1$ and $x - 2y + kz = 1$ have (i) unique solution ; (ii) no solution ; (iii) more than one solution.

Or

(b) Show that the set of vectors (1, 0, 4, 3) (2, 1, -1, 1) and (3, 2, -6, -1) are linearly dependent. Can you express (1, 2, -14, -11) as a linear combination of the above vectors ?

III. (a) Solve the following LP problem by simplex method

$$\text{Maximize } Z = 5x_1 + 10x_2 - 5x_3$$

$$\text{subject to } x_1 + 2x_2 - x_3 \leq 25$$

$$x_1 + 4x_2 + 3x_3 \leq 20$$

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

Or

Turn over

- (b) Solve the following LP problem by two-phase method.

$$\text{Minimize } Z = 4x_1 + 8x_2$$

$$\text{subject to } x_1 + 2x_2 \geq 10$$

$$5x_1 + 5x_2 \geq 15$$

$$x_1, x_2 \geq 0.$$

- IV. (a) Solve the following transportation problem by stepping stone method on uv -method.

Source \ Destination	1	2	3	Availability/day
1	5	10	15	100
2	20	25	28	150
3	3	2	5	100
Requirement/day	90	140	120	

Or

- (b) Solve the following two person zero sum game by graphical method :

$$\text{Player B} \begin{pmatrix} 5 & 2 & -3 & 5 & -1 \\ -1 & 8 & 4 & 3 & 5 \end{pmatrix}$$

- V. (a) Customers arrive at a refalling station randomly according to Poisson process at a rate of 20 per hour. The service times are exponentially distributed with a mean time of 100 seconds. There is only one server in the station. Find the mean, number of customers in the refalling station, average waiting time of a customer, total time spent in the station and fraction of time the station is empty.

Or

- (b) Solve the following dynamic programming problem :

$$\text{Minimize } Z = x_1^2 + x_2^2 + 5x_3^2$$

$$\text{subject to } x_1 + 2x_2 + 3x_3 = 25$$

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

[4 × 15 = 60 marks]