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Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2007

ME 04 605—OPERATIONS RESEARCH

(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

Answer **all** *questions.*

1. (a) Determine the rank of the matrix :

$$\begin{pmatrix} 1 & -2 & 3 & 1 \\ 2 & 3 & 1 & 1 \\ 4 & -1 & 7 & 3 \\ 5 & 4 & 5 & 3 \end{pmatrix}.$$

(b) For what value of K will be the Matrix :

$$\begin{pmatrix} 1 & -2 & 3 & 4 \\ 3 & 1 & 0 & 3 \\ 5 & 4 & -3 & k \end{pmatrix}.$$

(c) What is meant by Linear Programming ? What are the steps involved in Linear programming planning ?

(d) Define Feasible, optimal solutions. State the steps behind optimal solution of a transportation problem and the methods to find out initial basic feasible solution.

(e) State the steps involved in Evaluating the New Solution.

(f) Define transportation problem. Write the mathematical formulation of a transportation model.

(g) What are the characteristics of Dynamic programming problem ?

(h) Write the Dynamic algorithm.

($8 \times 5 = 40$ marks)

2. (a) Find λ and μ such that $x + 2y + \lambda z = \underline{l}$; $x + 2\lambda y + z = \mu$; $\lambda x + 2y + z = 1$ has (i) no solution ; (ii) unique solution ; (iii) many solutions.

Or

Turn over

(b) Find the condition to be satisfied by a, b, c so that the system $x + 2y - 3z = a$; $2x - y + 2z = b$; $4x + 3y - 4z = c$ will be consistent.

3. (a) Maximise $Z = 2x + 3x_2 + z_3$

subject to $x_1 + 3x_2 + 2x_3 = 5$

$2x_1 + 2x_2 + 5x_3 = 8.$

Find the following :—

(i) Basic feasible solution.

(ii) Is the solution feasible or optimal ?

(iii) Optimal basic feasible solution.

(iv) Is the non-degenerate solution feasible.

Or

(b) Solve the following LPP by graphical method :—

Maximise $Z = 3x_1 + 5x_2$

subject to constraints :

$x_1 + 2x_2 \leq 2000$

$2x_1 + x_2 \leq 2000$

$x_2 \leq 600$ and $x_1, x_2 \geq 0.$

4. (a) A company has four warehouses A, B, C and D. It is required to deliver a product from these warehouses to three customers P, Q and R. The warehouses have the following amount in stock.

Warehouse ...	A	B	C	D
No. of units ...	15	16	12	13

The customer requirements are

Customer ...	P	Q	R
	18	20	18.

Table below gives to cost of transporting one unit from warehouse to the customer.

	A	B	C	D
P	8	9	6	3
Q	6	11	5	10
R	3	8	7	9

Find the minimum cost involved in this transfer using Vogel's approximation method.

Or

(b) A company has to transport its product from 3 plants 3 distribution centres. The availability and demand of units of product, with unit transportation costs in rupees are given below :

Find the optimal transport pattern. Find the initial basic solution using least-cost cell method.

Plant	*Distribution Centre*			
	D_1	D_2	D_3	*Availability*
P_1	16	19	12	140
P_2	12	13	19	160
P_3	14	28	8	120
Demand (units)	100	150	170	420 / 420

5. (a) Use dynamic Programming method to solve Maximise $z = y_1, y_2, y_3$ subject to constraints :

$y_1 + y_2 + y_3 = 6$ and

$y_1, y_2, y_3 \geq 0$.

Or

(b) A cosmetics manufacturing company is interested in selecting the advertising media for its product and the frequency of advertising in each media. The data collected over the past two years regarding the frequency to advertising in three medias of news paper, radio and Television and the related sales of the product gi ves the following results.

Excpted sales in '000 rupees

Frequency/Week	*Television*	*Radio*	*Newspaper*
1	220	150	100
2	275	250	175
3	325	300	225
4	350	320	250

The cost of advertising in newspaper is Rs. 500 per appearance in radio and television Rs. 4,500 per week for advertisement. The problem is of determining the optimal combination of advertising media and advertising frequency. Using the dynamic progarmme techniques, solve the above problem.

(4 × 15 = 60 marks)