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13662/NH

B/2111

LINEAR PROGRAMMING

Paper–II

Semester–III

Time Allowed : 3 Hours] [Maximum Marks : 40

Note : The candidates are required to attempt **two** questions each from Sections A and B carrying 6 marks each and the entire Section C consisting of 8 short answer type questions carrying 2 marks each.

SECTION—A

1. A company has two grades of inspectors 1 and 2 who are to be assigned to a quality inspection work.

It is required that at least 1800 pieces are inspected per 8-hour day. Grade 1 inspectors can check pieces at the rate of 25 per hour with an accuracy of 98%. Grade 2 inspectors can check pieces at the rate of 15 pieces per hour with an accuracy of 95%. The wage rate for grade 1 inspector is ₹40 per hour while that of grade 2 is ₹30 per hour. Each time an error is caused by the inspector the cost to the company is ₹20. The company has eight grade 1 and ten grade 2 inspectors. The company wants to determine the optimal assignment of inspectors to minimize total inspection cost. Formulate it as LPP and solve graphical method. 6

2. Solve simplex method Maximize $2x_1 - x_2 + x_3$ subject to the constraints : 6

$3x_1 + x_2 + x_3 \le 60, x_1 - x_2 + 2x_3 \le 10, x_1 + x_2 - x_3 \le 20;$
$x_1 + x_2 - x_3 \ge 0.$

3. Solve using Big M method. 6

Maximize $z = x_1 + 2x_2 + 3x_3 - x_4$ subject to the constraints :

$x_1 + 2x_2 + 3x_3 = 15$. $2x_1 + x_2 + 5x_3 = 20$.

$x_1 + 2x_2 + x_3 + x_4 = 10$. $x_1, x_2, x_3, x_4 \geq 0$.

4. Solve the LPP *maximize* $z = 22x_1 + 30x_2 + 25x_3$ subject to constraints :

$2x_1 + 2x_2 \leq 100$, $2x_1 + x_2 + x_3 \leq 100$,

$x_1 + 2x_2 + 2x_3 \leq 100$; $x_1, x_2, x_3 \geq 0$.

SECTION—B

5. Find the initial solution in the following transportion problem by Vogel's approximation method. Also obtain the optimum solution : 6

	D_1	D_2	D_3	D_4	Supply
F_1	1	2	3	4	30
F_2	7	6	2	5	50
F_3	4	3	2	7	35
Demand	15	30	25	45	

6. Find the initial solution in the following transportation problem by least cost method. Also obtain the optimum solution : 6

	D	E	F	Supply
A	2	1	4	50
B	3	1	2	150
C	5	6	7	200
Demand	100	130	200	

7. Give the mathematical formulation of assignment problem. Give two applications of assignment problem. Explain a method of solving the assignment problem. 6

8. Solve the following assignment problem using Hungarian method. The matrix entries are processing times in hour : 6

		Operations				
		O_1	O_2	O_3	O_4	O_5
Jobs	J_1	5	5	7	4	8
	J_2	6	5	8	3	7
	J_3	6	8	9	5	10
	J_4	7	6	6	3	6
	J_5	6	7	10	6	11

SECTION—C

9. Answer the following questions briefly : 8×2=16

(i) Differentiate between basic variable and slack variable.

(ii) Explain the term convex set. Is intersection of two convex sets is a convex set?

(iii) Explain the terms Hyper planes and Half-spaces.

(iv) Write down the steps of Vogel's approximation method to find the initial basic feasible solution.

(v) Write down the condition when transportation problem has alternative optimal solution.

(vi) Define the term degeneracy in the transportation problem.

(vii) What is Feasible region? Is it necessary that it should always be a convex set?

(viii) What are similarities between Transportation and Assignment problem?