L-4/2111

SET-2

Optimization Techniques-I
Paper: MM-609/AMC-309
(Semester III)

13115/N

Time: 3 Hours

Maximum Marks: 70

SECTION- A

Note: Attempt any two questions. 2×10=20

1. Solve the following L.P.P. by dual simplex method:

Maximize $z = -4x_1 - 6x_2 - 18x_3$

subject to the constraints :

$x_1 + 3x_3 \geq 3,$

$x_2 + 2x_3 \geq 5;\quad x_1, x_2, x_3 \geq 0$

2. Given LPP

Maximize $z = 2x_1 + 3x_2 + 4x_3$

subject to the constraints :

$x_1 + 2x_2 + 3x_3 \leq 11,$

$2x_1 + 3x_2 + 2x_3 \leq 10;\quad x_1, x_2, x_3 \geq 0$

With its optimal table as

BV	x_1	x_2	x_3	s_1	s_2	Solution
z	0	½	0	1	1/2	16
x_3	0	¼	1	1/2	-1/4	3
x_1	1	5/4	0	-1/2	3/4	2

(a) Within what range the cost of x_1 varies so that the optimality remains unaffected.

(b) Within what range the cost of x_2 varies so that the optimality remains unaffected.

(c) Discuss the effect of changing the costs 2, 3, 4 of the decision variables x_1, x_2, x_3 to 1, 2, 2.

3. Solve the following mixed integer programming problem:

Maximize $z = 4x_1 + 6x_2 + 2x_3$

subject to the constraints :

$4x_1 - 4x_2 \leq 5,$

$-x_1 + 6x_2 \leq 5,$

$-x_1 + x_2 + x_3 \leq 5,$

$x_1, x_2, x_3 \geq 0$; x_1 and x_3 are integers.

4. Solve the following problem using dynamic programming :

Minimize $z = x_1^2 + x_2^2 + x_3^2$

subject to the constraints :

$x_1 + x_2 + x_3 \geq 15$ and $x_1, x_2, x_3 \geq 0$

2×10=20

SECTION- B

Note: Attempt any two questions.

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

6. There are five jobs to be assigned to five machines. Cost of completion of the jobs on the respective machine are as given in the table below:

	M_1	M_2	M_3	M_4	M_5
J_1	65	40	90	80	90
J_2	60	35	100	85	85
J_3	60	38	105	90	95
J_4	70	45	120	90	100
J_5	65	40	105	87	90

Find optimal assignment of jobs to the machines so as to minimize the total cost of all the jobs. Is the solution obtained unique? If not, work out an alternative solution and calculate the total cost.

7. Find the starting solution in the following transportation problem by Vogel's approximation method. Also obtain the optimum solution:

	D_1	D_2	D_3	D_4	Supply
S_1	6	1	9	3	70
S_2	11	5	2	8	55
S_3	10	12	4	7	90
Demand	85	35	50	45	

8. Solve the following game graphically:

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	2	1	0	−2
	A_2	1	0	3	2

2×10=20

SECTION- C

9. All parts are compulsory.

a) Define a convex set. Prove that $\{(x_1, x_2): 3x_1^2 + 2x_2^2 \leq 6\}$ is convex.

b) Explain the use of artificial variables in Linear Programming.

c) What is game theory? What are the various types of games?

d) Distinguish between basic variable and slack variable.

e) What is dynamic programming? Explain the advantages of dynamic programming.

f) Prove that dual of dual is primal.

g) What is a balanced transportation problem?

h) Define and explain the terms: unbounded problem and No feasible solution.

i) Explain the difference between transportation problem and assignment problem.

j) State the general form of an integer programming problems.

10×3=30