[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4968 **H**

Unique Paper Code : 2362571201

Name of the Paper : DSC- A2 : Advanced Linear Programming

Name of the Course : **B.A. (Prog.) / BSc. (Physical Sciences / Mathematical Sciences) with Operational Research as one of the Core Disciplines**

Semester : II

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions in all.
3. **All** questions carry equal marks.

1. (a) Explain the significance of duality theory in Linear Programming Problem. Also, prove that the dual of the dual is the primal. (10)

P.T.O.

(b) Write the dual of the following Linear Programming Problem :

Minimum $Z = 2x + 3y + 4z$

subject to $2x + 3y + 5z \geq 2$

$3x + y + 7z = 3$

$x + 4y + 6z \leq 5$

$x, y \geq 0$ and z unrestricted. (8)

2. (a) Explain Weak Duality Theorem and Strong Duality Theorem. Also, write the advantages of Dual Simplex method. (8)

(b) Solve the following Linear Programming Problem using Dual Simplex method.

Maximize $Z = -2x_1 - 3x_3$

subject to $x_1 - 2x_2 + 4x_3 \geq 8$

$x_1 + x_2 - x_3 \geq 5$

$x_1, x_2, x_3 \geq 0$.. (10)

3. Solve the following Linear Programming Problem :

Maximize $Z = 2x_1 + 5x_2 + 8x_3$

subject to $2x_1 + 3x_2 + 4x_3 \leq 15$

$2x_1 + 3x_2 + x_3 \leq 35$

$3x_1 + x_2 + 3x_3 \leq 40$

$x_1, x_2, x_3 \geq 0$.

Consider the following changes in the problem –

(i) Determine the range of b_1 and b_2 so that the current solution remains feasible.

(ii) Determine the effect on the current optimal solution if $c_1 = 2$ changes to $c_1 = 7$. (18)

4. (a) Explain Transportation Problem and write the mathematical formulation in the form of an LPP. (8)

(b) Obtain an initial basic feasible solution to the following Transportation Problem by (i) Least Cost Entry method, and (ii) Vogel's Approximation method. (10)

	W	X	Y	Z	Supply
A	7	3	5	5	34
B	5	5	7	6	15
C	8	6	6	5	12
D	6	1	6	4	19
Demand	21	25	17	17	

5. (a) Formulate cost minimization Assignment Problem as a Linear Programming Problem and define all notations used. (8)

(b) Solve the following Assignment Problem using Hungarian method. The matrix entries are processing times in hours. (10)

	O_1	O_2	O_3	O_4	O_5
J_1	20	22	35	22	18
J_2	4	26	24	24	7
J_3	23	14	17	19	19
J_4	17	15	16	18	15
J_5	16	19	21	19	25

6. Define Transhipment problem. Solve the following Transhipment problem.

		Destinations				
		S1	S2	D1	D2	Available
Sources	S1	0	2	3	4	5
	S2	2	0	2	4	25
	D1	3	2	0	1	
	D2	4	4	1	0	
Required				20	10	

(18)

7. (a) What is Travelling Salesmen Problem? (8)

(b) Solve the following Travelling Salesmen Problem in order to minimize the distance travelled by him if he has to visit each city exactly once and return back to home city. (10)

	A	B	C	D	E
A	-	2	5	7	1
B	6	-	3	8	2
C	8	7	-	4	7
D	12	4	6	-	5
E	1	3	2	8	-