[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1423 F

Unique Paper Code : 2362571201

Name of the Paper : DSC-4 : Advanced Linear Programming

Name of the Course : **B.A. (Program)**

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) Write the Dual of the following Linear Programming Problems :

(i) Maximize $Z = 2x_1 + 5x_2 + 6x_3$

subject to $5x_1 + 6x_2 - x_3 \leq 3$

$-2x_1 + x_2 + 4x_3 \leq 4$

$x_1 - 5x_2 + 3x_3 \leq 1$

$-3x_1 - 3x_2 + x_3 \leq 6$

$x_1, x_2, x_3 \geq 0.$

(ii) Minimize $Z = 2x_1 + 3x_2 + 4x_3$

subject to $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 = 3$

$x_1 + 4x_2 + 6x_3 \leq 5$

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

(10)

(b) Show that Dual of Dual is Primal. (8)

2. (a) Explain Economic Interpretation of Duality. (6)

(b) Use Dual Simplex Method to solve the following Linear Programming Problem :

Maximize $Z = x_1 + x_2$

subject to $2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

$x_1, x_2 \geq 0.$ (12)

3. Solve the following Linear Programming Problem :

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

subject to $x_1 + 4x_2 + 3x_3 \leq 240$

$2x_1 + x_2 + 5x_3 \leq 300$

$x_1, x_2, x_3 \geq 0.$

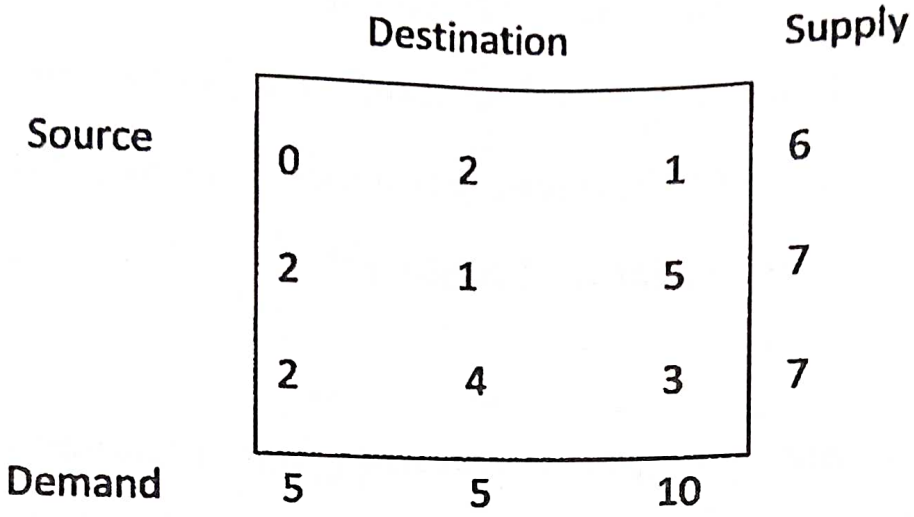
Consider the following changes in the problem –

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

(ii) Determine the effect on the current optimal solution if c = [2, 4, 3] changes to c = [12, 4, 3]. (18)

4. (a) Formulate cost minimization Assignment Problem as a Linear Programming Problem and define all notations used. (6)

(b) Compare the initial basic feasible solutions obtained by the North West Comer Method, Least Cost Method and Vogel's Approximation Method for the following Transportation Problem. (12)



5. (a) Solve the following maximization Assignment Problem by optimally assigning 5 jobs to 5 people using Hungarian method. The sales are estimated as follows : (12)

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

(b) Write the balancing condition in Assignment Problem and Transportation Problem and the procedure to solve unbalanced problems. Explain, how Assignment Problem is a special case of Transportation Problem? (6)

6. (a) State and prove necessary and sufficient condition for Transportation Problem to have a feasible solution. (6)

(b) All India Transport Company ships truckloads grain from three warehouses to four mills. The supply and the demand together with the unit transportation costs per truckload on the different routes are summarized in the transportation parameter table given below. Solve the cost minimization Transportation Problem and find the allocations that minimizes the total transportation cost. (12)

		Mill 1	2	3	4	Supply
	1	10	2	30	11	15
Warehouse	2	22	7	9	20	25
	3	14	14	16	18	10
Demand		5	15	15	10	

7. (a) Solve the following Travelling Salesmen Problem 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	-

(b) Write a short note on :

(i) Travelling Salesman Problem

(ii) Transhipment Problem (8)