M.Sc.(Mathematics) (New CBCS Pattern) Semester - III

PSCMTH15(A) - Optional : Operations Research-I

P. Pages : 3 **GUG/S/23/13763**

Time : Three Hours * 2 4 9 9 * Max. Marks : 100

Notes : 1. Solve all the **five** questions.
2. All questions carry equal marks.

UNIT – I

1. a) Explain the simplex algorithm. **10**

b) Find the maximum value of $z = 107x_1 + x_2 + 2x_3$ **10**

Subject to the constraints:

$14x_1 + x_2 - 6x_3 + 3x_4 = 7, 16x_1 + x_2 - 6x_3 \le 5,$

$3x_1 - x_2 - x_3 \le 0, x_1, x_2, x_3, x_4 \ge 0$

OR

c) Write the dual of LPP: Minimize $z = 3x_1 - 2x_2 + 4x_3$ **10**

Subject to the constraints: $3x_1 + 5x_2 + 4x_3 \ge 7, 6x_1 + x_2 + 3x_3 \ge 4, 7x_1 - 2x_2 - x_3 \le 10$

$x_1 - 2x_2 + 5x_3 \ge 3, 4x_1 + 7x_2 - 2x_3 \ge 2, x_1 \ge 0, x_2 \ge 0, x_3 \ge 0$

d) Use duality to solve the LPP: $z = 2x_1 + x_2$ subject to the constraints: **10**

$x_1 + 2x_2 \le 10, x_1 + x_2 \le 6, x_1 - x_2 \le 2, x_1 - 2x_2 \le 1, x_1, x_2 \ge 0$

UNIT – II

2. a) Obtain the optimum basic feasible solution to the following degenerate transportation problem. **10**

		Warehouse D_1	D_2	D_3	D_4	
Factory	01	23	27	16	18	30
	02	12	17	20	51	40
	03	22	28	12	32	53
Requirement		22	35	25	41	123

Availability

b) For the transportation problem given below, find a basic feasible solution by North -West corner method. **10**

Factories	Warehouses					Availability
	W_1	W_2	W_3	W_4	W_5	
F_1	20	28	32	55	70	50
F_2	48	36	40	44	25	100
F_3	35	55	22	45	48	150
Requirement	100	70	50	40	40	

OR

c) Solve the assignment problem: **10**

	A	B	C	D
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

d) Obtain an initial basic feasible solution to the transportation problem using the Vogel's approximation method. **10**

Warehouse	Stores I	Stores II	Stores III	Stores IV	Availability
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	-1	4	2	19
Requirement	21	25	17	17	80

UNIT – III

3. a) Maximize $z = y_1 y_2 y_3 - - - - - y_n$ subject to the constraints $y_1 + y_2 + - - - - + y_n = c$ & $y_j \geq 0$. **10**

b) Use dynamic programming to solve the LPP: **10**
Maximize $z = 3x_1 + 5x_2$ subject to
$x_1 \leq 4, x_2 \leq 6, 3x_1 + 2x_2 \leq 18$ & $x_1, x_2 \geq 0$

OR

c) Use dynamic programming to solve the LPP: **10**
Minimize $z = y_1^2 + y_2^2 + y_3^2$ subject to
$y_1 + y_2 + y_3 \geq 15$ & $y_1, y_2, y_3 \geq 0$

d) Discuss the characteristics of the dynamic programming. **10**

UNIT – IV

4. a) Solve the following game whose pay off matrix is given by **10**

		B: H	B: T
A	H	8	-3
	T	-3	1

b) Solve the 2×2 game graphically. **10**

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

OR

c) For what value of μ the game with pay off matrix is strictly determinable? **10**

		Player B		
		B_1	B_2	B_3
Player A	A_1	μ	6	2
	A_2	-1	μ	-7
	A_3	-2	4	μ

d) Solve the problem graphically. **10**

	Player B		
Player A	3	-3	4
	-1	1	-3

5. a) Obtain the basic feasible solution to the system. **5**
$x_1 + 2x_2 + x_3 = 4, 2x_1 + x_2 + 5x_3 = 5$

b) Explain the assignment problem. **5**

c) Discuss the characteristics of dynamic programming. **5**

d) Define: **5**

i) Pure strategy.

ii) Mixed strategy.

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