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

PSCMTH15A - Optional - Operations Research-I

P. Pages : 3 **GUG/W/24/13763**

Time : Three Hours * 5 4 4 0 * Max. Marks : 100

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

UNIT – I

1. a) Use simplex method to solve the LPP: Max $z = 4x_1 + 10x_2$ subject to the constraints: **10**
$2x_1 + x_2 \le 50, 2x_1 + 5x_2 \le 100, 2x_1 + 3x_2 \le 90, x_1, x_2 \ge 0$.

b) Use Big-M method to solve the LPP : Max $z = 6x_1 + 4x_2$ subject to the constraints: **10**
$2x_1 + 3x_2 \le 30, 3x_1 + 2x_2 \le 24, x_1 + x_2 \ge 3, x_1, x_2 \ge 0$.

OR

c) Use duality to solve the LPP: Max $z = 2x_1 + x_2$ subject to the constraints : **10**
$x_1 + 2x_2 \le 10, x_1 + x_2 \le 6, x_1 - x_2 \le 2, x_1 - 2x_2 \le 1, x_1, x_2 \ge 0$

d) Use dual simplex method to solve the LPP: Min $z = 3x_1 + x_2$ subject to the constraints: **10**
$x_1 + x_2 \ge 1, 2x_1 + 3x_2 \ge 2, x_1, x_2 \ge 0$.

UNIT – II

2. a) For the transportation problem given below, find an initial 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	

b) Obtain the optimum solution of the TP by Vogel's approximation method. **10**

	D_1	D_2	D_3	D_4	Supply
S_1	3	7	6	4	5
S_2	2	4	3	2	2
S_3	4	3	8	5	3
Demand	3	3	2	2	10

OR

c) Consider the problem of assignment of five jobs to five persons. The assignment costs are given as follows. **10**

		Jobs				
		1	2	3	4	5
Persons	A	8	4	2	6	1
	B	0	9	5	5	4
	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

Determine the optimum assignment schedule.

d) A departmental head has four subordinates & four tasks to be performed. The subordinates differ in efficiency & the tasks differ in their intrinsic difficulty. His estimates of the time each man would take to perform each task is given below in the matrix: **10**

Tasks	Men			
	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

How should the tasks be allocated, one to each man so as to minimize the total man hours.

UNIT – III

3. a) Write the characteristics of dynamic programming. **10**

b) Use the Dynamic programming to show that – **10**

$z = p_1 \log p_1 + p_2 \log p_2 + ... + p_n \log p_n$

Subject to the constraints $p_1 + p_2 + ... + p_n = 1$ and $p_j \geq 0 (j = 1, 2, ..., n)$ is minimum,

when $p_1 = p_2 = ... = p_n = \frac{1}{n}$.

OR

c) Use dynamic programming to solve the LPP: **10**

Minimize $z = y_1^2 + y_2^2 + y_3^2$ subject to constraints: $y_1 + y_2 + y_3 \geq 15$ and $y_1, y_2, y_3 \geq 0$.

d) Use dynamic programming to solve the following LPP: **10**

Maximize $z = 3x_1 + 5x_2$ subject to the constraints:

$x_1 \leq 4,\ x_2 \leq 6, 3x_1 + 2x_2 \leq 18$ and $x_1,\ x_2 \geq 0$.

UNIT – IV

4. a) Solve the following 2×4 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

b) For what values of λ, the game with following payoff matrix is strictly determinable? **10**

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

OR

c) Solve the following game whose pay off matrix is given by- **10**

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

d) Use matrix oddment method to solve the following 3x3 game: **10**

$$\begin{bmatrix} 0 & 1 & 2 \\ 2 & 0 & 1 \\ 1 & 2 & 0 \end{bmatrix}.$$

5. a) Prove that the dual of the dual is the primal. **5**

b) Explain the mathematical formulation of the assignment problem. **5**

c) Write the dynamic programming algorithm. **5**

d) Define : (i) Pure strategy (ii) Mixed strategy. **5**

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