Total No. of Printed Pages-7

6 SEM TDC DSE MTH (CBCS) 2 (H)

2023

(May/June)

MATHEMATICS

(Discipline Specific Elective)

(For Honours)

Paper : DSE-2

(Linear Programming)

Full Marks : 80 Pass Marks : 32

Time : 3 hours The figures in the margin indicate full marks for the questions

1×8=8

1. Answer the following questions : degenerate basic feasible (a) Define solution.

Write about decision variable. (b)

Define slack variable. (c)

Write the standard form of primal in (d) (Turn Over) duality.

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(2)TELC TRUE MATH (CROS) 2 (EI)

(e) Define symmetric primal dual problem.

- State (f) the rim condition of transportation problem.
- Define saddle point in a game theory. (q)
- (h) What is fair game in a game theory?
- 2. Answer any two from the following : $2 \times 2 = 4$
 - Write the mathematical formulation of (a)transportation problem.
 - Explain briefly the basic solution of *(b)* linear programming problem.
 - Describe general rule of dominance (c)property of game theory.
- 3. Answer the following questions : 4×5=20
 - (a) Write the rule of construction of dual
 - Write the characteristic of standard (b) form of general linear programming

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(Continued)

(c) Find the dual :

Max $Z = 4x_1 - 3x_2 + 2x_3$

subject to

(d)

 $x_1 - 7x_2 + 3x_3 \le 6$ $-5x_2 + 3x_3 \ge 8$ $2x_1 - 4x_2 + 5x_3 = 7$ $x_1, x_3 \ge 0, x_2$ is unrestricted in sign In an assignment problem, if we add (or subtract) a constant to every element of a row (or column) of the cost matrix [c_{ij}], then show that an assignment plan that minimizes the total cost for new cost matrix also minimizes the total cost for the original cost matrix. Find the range of the values of p and qwhich will render the entry (2, 2), a (e) saddle point for the game : Player B

B

2

10

 B_3

5

9

6

5

· (Turn Over)

4

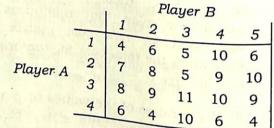
 A_1 Player A A₂

Prove that dual of the dual is primal **4**. (a) itself.

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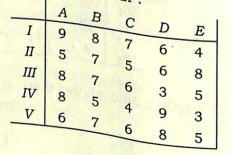
If x^* and w^* be any two feasible solutions of the primal, Max $Z_x = cx$, subject to $Ax \leq b$, $x \ge 0$ and corresponding dual, Min $Z_w = b'w$, subject to $A'w \ge c', w \ge 0$ respectively and $cx^* = b'w^*$, then x^* and w^* are optimal feasible solutions of the primal and dual respectively. Prove it.

Solve the pay-off matrix with respect to (b)player A by using dominance property :



5. Answer any one of the following : Find the optimal assignment of the (a)

corresponding assignment cost from the following cost matrix :



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(Continued)

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5

6

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	(b)	(b) Find the optimal assignment profit from the following profit matrix :							
		the follo	D_1			D_4	D_5		
			2	4	0		4	N. S. A.	
			2	4 4	6	8	4	free a	
		0 ₂		9		10	4		
		0 ₃	8	6	12	7	4		
		0 ₄	2	8	5	8	8	what.	
		0 ₅	11111	1				8×2	
	Ans	wer any	two o	of the	follo	wing	41		
	(a)	Salva by	Big-	Mm	ethod	1:		The second	
	(a) Solve by Big-M method : Max $Z = -2x_1 - x_2$								
	subject to $3x_1 + x_2 = 3$								
	$4x_{1} + 3x_{2} \ge 0$								
	$x_1 + 2x_2 \le 4$								
	$\begin{array}{c} x_1 \\ x_1, \\ x_2 \ge 0 \end{array}$								
8 ²				1					
	(b)	Solve :		1.16	3	x0 +2	$2x_3$		
	(b) Solve : Min $Z = x_1 - 3x_2 + 2x_3$								
	subject to $3x_1 - x_2 + 2x_3 \le 7$ $3x_1 - x_2 + 4x_2 \le 12$								
			3.	$x_1 - x_1$	$c_1 + 4$	$x_2 \leq \frac{1}{2}$	12		
			1	. 2.	+ 8.	x3 -			
	$-2x_1 + 3x_2 + 8x_3 \le 10$ -4x ₁ + 3x ₂ + 8x ₃ \ge 0 x ₁ , x ₂ , x ₃ \ge 0								
				21	, , , , , , , , , , , , , , , , , , , ,			Turn OU	

=16

(Turn Over)

(6)

(c) Solve by two-phase method :

$$Min \quad Z = \frac{15}{2} x_1 - 3x_2$$

subject to

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

7. Answer any one of the following :

9

(Continued)

Determine the initial basic feasible (a)solution to the following transportation problem by least cost method and then find the optimal solution :

where O_i and D_j denote the *i*th origin and jth destination respectively.

Find the initial basic feasible solution using VAM and find the optimal

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(b)

7)

- 8. Answer any one of the following :
 - Obtain the optimal strategies of each (a)player from the pay-off matrix :



7

Player A can choose his strategies from A_1 , A_2 and A_3 only while player B can (b) choose from B_1 , B_2 only. The rule of game states that the payment should be made in accordance with the selection

of strategies : Payment to be made Strategy pair selected A to B ₹1 B to A ₹6 $A_1 B_1$ B to A ₹3 $A_1 B_2$ B to A ₹4 $A_2 B_1$ A to B ₹2 $A_2 B_2$ A to B ₹6 $A_3 B_1$ Find the pay-off matrix and optimal strategies of each player. P23-700/819 6 SEM TDC DSE MTH (CBCS) 2 (H) ***