

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Fifth Semester

Mathematics

Major Elective — OPERATIONS RESEARCH – I

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. Linear programming problem involving only two decision variables can be solved by
 - (a) Graphical method
 - (b) Simplex method
 - (c) Both (a) and (b)
 - (d) None of the above

2. Simplex method was introduced by
 - (a) G.B Dantzig
 - (b) Konig
 - (c) Miller
 - (d) Taha
3. If the primal problem has an unbounded solution then the dual problem has _____
 - (a) feasible solution
 - (b) basic solution
 - (c) no feasible solution
 - (d) optimal solution
4. If the dual problem has n variables, then the primal problem has _____ constraints.
 - (a) n
 - (b) $n+1$
 - (c) $n-1$
 - (d) none
5. All the basis for a transportation problem are
 - (a) triangular
 - (b) non-triangular
 - (c) equal
 - (d) unequal
6. Which of the following method used to find the optimum solution of transportation problem?
 - (a) VAM method
 - (b) North-West corner rule
 - (c) MODI method
 - (d) Matrixminima method

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7. In a balanced assignment problem the cost matrix is
 - (a) Symmetric matrix
 - (b) Square matrix
 - (c) Unsymmetric matrix
 - (d) Not a square matrix
8. If an assignment problem having 4 workers and 3 jobs, then the total number of possible assignment is
 - (a) 4
 - (b) 3
 - (c) 7
 - (d) 12
9. If indicates the time required by a job on each machine
 - (a) Elapsed time
 - (b) Processing time
 - (c) Idle time
 - (d) None
10. Number of sequences require to evaluate sequencing problem with 6 jobs, 5 machines
 - (a) $(6!)^5$
 - (b) $(5!)^6$
 - (c) $5! \times 6$
 - (d) 5×6

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PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Solve the following LPP using graphical method

$$\text{Maximize } z = x_1 + x_2$$

S.T

$$x_1 + x_2 \leq 1$$

$$-3x_1 + x_2 \geq 3$$

$$x_1, x_2 \geq 0.$$

Or

- (b) Solve the following LPP, using graphical method

$$\text{Minimize } z = x_1 + x_2$$

S.t

$$5x_1 + 3x_2 \leq 15$$

$$x_1 + x_2 \geq 6$$

$$x_1, x_2 \geq 0.$$

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[P.T.O.]

12. (a) Write the dual of the following LPP.

$$\text{Minimize } z = 4x_1 + 6x_2 + 18x_3$$

S.t

$$x_1 + 3x_2 \geq 3$$

$$x_2 + 2x_3 \geq 5$$

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

Or

- (b) Prove that the dual of the dual is primal.

13. (a) Explain the North - West corner rule.

Or

- (b) Obtain an initial basic feasible solution to the following transportation problem.

	D	E	F	G	
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
	200	225	275	250	

14. (a) Write the mathematical formulation of the assignment problem.

Or

- (b) State and prove reduction theorem.

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17. (a) Use duality to solve

$$\text{Maximize } z = 2x_1 + x_2$$

S.t.

$$x_1 + x_2 \leq 10$$

$$x_1 + x_2 \leq 6$$

$$x_1 - x_2 \leq 2$$

$$x_1 - 2x_2 \leq 1$$

$$x_1, x_2 \geq 0.$$

Or

- (b) Explain the dual simplex method.

18. (a) Write the transportation algorithm in detail.

Or

- (b) Solve the following transportation problem.

	D ₁	D ₂	D ₃	D ₄	
S ₁	3	7	6	4	5
S ₂	2	4	3	2	2
S ₃	4	3	8	5	3
	3	3	2	2	

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15. (a) Explain the basic terms used in sequencing problem.

Or

- (b) Find the optimum sequence of the following data.

Jobs : J₁ J₂ J₃ J₄ J₅ J₆

Machine A : 1 3 8 5 6 3

Machine B : 5 6 3 2 2 10

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

16. (a) Use penalty method to solve the LPP.

$$\text{Maximize } z = 6x_1 + 4x_2$$

S.t

$$2x_1 + 3x_2 \leq 30$$

$$3x_1 + 2x_2 \leq 24$$

$$x_1 + x_2 \geq 3$$

$$x_1, x_2 \geq 0.$$

Or

- (b) Explain the simplex algorithm.

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19. (a) Write the Hungarian algorithm.

Or

- (b) Solve the following assignment problem.

	1	2	3
I	9	26	15
II	13	27	6
III	35	20	15
IV	18	30	20

20. (a) Solve the following sequencing problem.

Jobs : A B C D E F G H I

M₁ : 2 5 4 9 6 3 7 5 4

M₂ : 6 8 7 4 3 9 3 8 11

Or

- (b) Explain the processing 2 jobs through K machines.

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