(7 pages) **Reg. No. : .....**

Code No. : 10085 E **Sub. Code : SEMA 5 D/ AEMA 54**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Fifth Semester

Mathematics — Major Elective

OPERATIONS RESEARCH — I

(For those who joined in July 2017–2020)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A powerful technique to solve the linear programming problems involving three or more decision variables is ———

(a) Graphical method

(b) Simplex method

(c) Two-phase method

(d) None of these

2. The set of feasible solution to an LPP is a ———

(a) concave set (b) convex set

(c) null set (d) none

3. Number of variables in the dual of 4 constraint primal LPP is ———

(a) 1 (b) 2

(c) 3 (d) 4

4. In the standard form of the LPP, the primal - dual pair is said to be ———

(a) symmetric (b) unsymmetric

(c) equal (d) unequal

5. The transportation problem is balanced if ———

(a) $\Sigma a_i \neq \Sigma b_j$ (b) $\Sigma a_i > \Sigma b_j$

(c) $\Sigma a_i = \Sigma b_j$ (d) $\Sigma a_i < \Sigma b_j$

6. The number of allocated cells in the transportation problem must be ———

(a) $m+n$ (b) $m+n+1$

(c) $m+n-1$ (d) $n+1$

7. Assignment problem is balanced if ———

(a) $m \neq n$ (b) $m = n$

(c) $m+1 = n$ (d) $m = n+1$

8. Hungarian method was introduced by ———

(a) G.B. Dantzig (b) D. Konig

(c) D. Henry (d) None

9. The number of possible sequence in n jobs and m machines are ———

(a) $(n!)^m$ (b) $(m!)^n$

(c) $(n)^{m!}$ (d) $(m)^{n!}$

10. Which indicates the time required by a job on each machine?

(a) Idle time (b) Processing time

(c) Elapsed time (d) None

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the standard form of a LPP.

Or

(b) Solve using Graphical method

Max $z = 6x_1 + x_2$

S.t $2x_1 + x_2 \geq 3$, $x_2 - x_1 \geq 0$, $x_1, x_2 \geq 0$.

12. (a) Explain the formulation of a dual problem.

Or

(b) Write the dual of the following LPP.

Min $z = 4x_1 + 6x_2 + 18x_3$

S.t. $x_1 + 3x_2 \geq 3$, $x_2 + 2x_3 \geq 5$, $x_1, x_2, x_3 \geq 0$.

13. (a) Explain the matrix - minima method.

Or

(b) Find an initial basic feasible solution to the following transportation problem using North West corner rule.

	D_1	D_2	D_3	a_i
S_1	8	10	12	900
S_2	12	13	12	1000
S_3	14	10	11	1200
b_j	1200	1000	900	

14. (a) State and prove reduction theorem.

Or

(b) Solve the following assignment problem.

	A	B	C
I	8	7	6
II	5	7	8
III	6	8	7

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

Or

(b) Explain the processing n jobs and 3 machines.

PART C — ($5 \times 8 = 40$ marks)

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

16. (a) Write the simplex algorithm.

Or

(b) Solve using two-phase method

Maximize $z = 5x_1 + 3x_2$

S.t. $2x_1 + x_2 \leq 1$, $x_1 + 4x_2 \geq 6$, $x_1, x_2 \geq 0$.

17. (a) State and prove basic duality theorem.

Or

(b) Use duality solve the following

Max $z = 2x_1 + x_2$

S.t. $x_1 + 2x_2 \leq 10$, $x_1 + x_2 \leq 6$, $x_1 - x_2 \leq 2$,
$x_1 - 2x_2 \leq 1$, $x_1, x_2 \geq 0$.

18. (a) Explain the transportation algorithm.

Or

(b) Solve the transportation problem.

	A	B	C	D	Supply
X	6	1	9	3	70
Y	11	5	2	8	55
Z	10	12	4	7	90
Demand	85	35	50	45	

19. (a) Solve the following assignment problem.

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

Or

(b) Explain the Hungarian method.

20. (a) Find the optimum sequence for the following.

Jab :	1	2	3	4	5	6
Machine A :	30	120	50	20	90	100
Machine B :	80	100	90	60	30	10

Or

(b) Determine the optimal sequence.

Job :	A	B	C	D	E	F	G
M1 :	3	8	7	4	9	8	7
M2 :	4	3	2	5	1	4	3
M3 :	6	7	5	11	5	6	12
