K23U 0518

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS – OBE-Regular/Supplementary/ Improvement) Examination, April 2023
(2019 and 2020 Admissions)
DISCIPLINE SPECIFIC ELECTIVE IN MATHEMATICS
6B14BMAT : Operations Research

Time : 3 Hours Max. Marks : 48

SECTION – A

Answer **any 4** questions out of 5 questions. **Each** question carries **1** mark.

1. Define convex set.
2. Define a balanced transportation problem.
3. Write the basic terms used in sequencing problem.
4. State the max-min principle.
5. Define degenerate solution of an LPP. **(4×1=4)**

SECTION – B

Answer **any 8** questions out of 11 questions. **Each** question carries **2** marks.

6. Write the quadratic form $x_1^2 + 8x_1x_2 + 16x_2^2 - 3x_3^2$ in the form x^1Ax.
7. Write the procedure for graphical method in linear programming problem.
8. Write the dual of the linear programming problem
   Maximize $Z = 4x_1 + 2x_2$
   subject to $x_1 + x_2 \geq 3$, $x_1 - x_2 \geq 2$, $x_1, x_2 \geq 0$.

P.T.O.

9. Explain North West Corner method.
10. Explain duality in transportation problem.
11. Explain mathematical formulation of Assignment problem.
12. Write the optimal sequence algorithm for n jobs on k machines.
13. Explain maintenance crew scheduling.
14. Write the rules for determining a saddle point.
15. Explain pure strategy and mixed strategy.
16. Define standard form of an LPP. **(8×2=16)**

SECTION – C

Answer **any 4** questions out of 7 questions. **Each** question carries 4 marks.

17. Determine whether the quadratic form $x_1^2 + 2x_2^2 + 2x_3^2 - 2x_1x_2 - 2x_2x_3$ is positive definite.
18. An animal feed company must produce 200 lbs of a mixture containing the ingredients X_1 and X_2. X_1 costs Rs. 3 per lbs and X_2 costs Rs. 8 per lbs. Not more than 80 lbs of X_1 can be used and minimum quantity to be used for X_2 is 60 lbs. Find how much of each ingredient should be used if the company wants to minimize the cost. Formulate the problem mathematically.
19. Obtain an initial basic feasible solution using least cost method.

	D_1	D_2	D_3	D_4	Capacity
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	2	2	1	10
Demand	4	6	8	6	

20. Write the algorithm to compute the initial basic feasible solution using VAM.

21. A department head has four tasks to be performed and three subordinates, the subordinates differ in efficiency. The estimates of time each subordinate would take to perform, is given below in the matrix. How should he allocate the tasks one to each man, so as to minimize the total man hours ?

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

22. Solve the following sequencing problem when passing out is not allowed.

Item	Machine (Processing time in hours)			
	A	B	C	D
I	15	5	4	15
II	12	2	10	12
III	16	3	5	16
IV	17	3	4	17

23. Solve the following 2 person zero sum game.

	Player B		
Player A	10	5	−2
	6	7	3
	4	8	4

(4×4=16)

SECTION – D

Answer **any two** questions out of 4 questions. It carries **6** marks.

24. Use simplex method to maximize $Z = x_1 + 2x_2 + 3x_3$
    subject to $x_1 + 2x_2 + 3x_3 \leq 10$.
    $x_1 + x_2 \leq 5$,
    $x_1, x_2, x_3 \geq 0$.

25. Solve the following transportation problem.

From	To			Available
	A	B	C	
I	6	8	4	14
II	4	9	8	12
III	1	2	6	5
Requirement	6	10	15	

26. Write the optimum sequence algorithm for n jobs on 2 machines.
27. Solve the following 2 × 2 game graphically.

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

(2×6=12)