K21U 0131

Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Degree (CBCSS – Reg./Supple./Improve.) Examination, April 2021
(2014 – 2018 Admissions)
CORE COURSE IN MATHEMATICS
6B14 MAT (Elective – A) : Operation Research

Time : 3 Hours Max. Marks : 48

SECTION – A

Answer **all** the questions. **Each** question carries **1** mark.

1. Define extreme point of a convex set.
2. What is basic solution to the L.P.P. ?
3. The solutions to a transportation problem with m-sources and n-destinations is feasible, if the number of allocations are
4. A sequencing problem involving six jobs and three machines requires evaluation of _____ sequences.

SECTION – B

Answer **any eight** questions. **Each** question carries **2** marks.

5. Show that $S = \{(x_1, x_2, x_3) : 2x_1 - x_2 + x_3 \leq 4\} \subset \mathbb{R}^3$ is a convex set.
6. Write down the quadratic form corresponding to the matrix $\begin{bmatrix} 2 & -3 & 1 \\ -3 & 4 & 2 \\ 1 & 2 & -6 \end{bmatrix}$.
7. Determine whether the quadratic form $2x_1^2 + 6x_2^2 - 6x_1x_2$ is positive definite or negative definite.
8. Define slack and surplus variables.

P.T.O.

9. State the general L.P.P. in (a) Standard form and (b) Canonical form.

10. Explain the use of artificial variable in a linear programming problem.

11. Describe a transportation table.

12. How the problem of degeneracy arises in a transportation problem ? Explain how will you overcome it.

13. Explain matrix minima method.

14. Define loops in T.P.

15. What is an assignment problem ? Give the mathematical formulation of it.

16. What is no passing rule in a sequencing algorithm ?

17. Explain the principal assumptions made while dealing with sequencing problem.

18. Differentiate the terms : Pure strategy, Mixed strategy.

19. Describe a two-person zero-sum game.

20. Define saddle point. Write the procedure to locate it.

SECTION – C

Answer **any four** questions. **Each** question carries **4** marks.

21. Solve graphically the following L.P.P. :

Maximize : $z = 5x_1 + 3x_2$

Subject to : $x_1 + x_2 \leq 6$

$2x_1 + 3x_2 \geq 6$

$0 \leq x_1 \leq 4$

$0 \leq x_2 \leq 3$

22. Write the various steps involved in the formulation of primal-dual pair.

23. State and prove the necessary and sufficient condition for the existence of a feasible solution to a transportation problem.

24. Find an initial basic feasible solution to the following transportation problem using North-West Corner Rule.

	I	II	III	IV	V	Availability
A	20	28	32	55	70	50
B	48	36	40	44	25	100
C	35	55	22	45	48	150
Requirement	100	70	50	40	40	

25. Solve the following assignment problem.

	A	B	C	D
1	10	25	15	20
2	15	30	5	15
3	35	20	12	24
4	17	25	24	20

26. Describe the method of processing 2 jobs through K machines.

27. Write a short note on maintenance crew scheduling.

28. Explain the graphical method of solving $2 \times n$ and $m \times 2$ games.

SECTION – D

Answer **any two** questions. **Each** question carries **6** marks.

29. a) Show that the set of all convex combinations of a finite number of points of $S \subset \mathbb{R}^n$ is a convex set.

    b) Let f(X) be a convex function on a convex set S. Show that the set of all points in S at which f(X) takes on its global minimum, is a convex set.

30. Solve the following L.P.P. using simplex method :

Maximize : $z = 2x_1 - x_2 + x_3$

Subject to : $3x_1 + x_2 + x_3 \leq 60$

$x_1 - x_2 + 2x_3 \leq 10$

$x_1 + x_2 - x_3 \leq 20$

$x_1, x_2, x_3 \geq 0$

31. Solve the following transportation problem :

	D_1	D_2	D_3	D_4	Availability
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
Requirement	20	40	30	10	

32. Explain Hungarian algorithm.

33. In a factory, there are six jobs to perform, each of which should go through two machines A and B, in the order A, B. The processing timings (in hours) for the jobs are given here. Determine the sequence for performing the jobs that would minimize the total elapsed time T. What is the value of T ?

Job	J_1	J_2	J_3	J_4	J_5	J_6
Machine A	1	3	8	5	6	3
Machine B	5	6	3	2	2	10

34. Solve the following game :

		Player A			
		I	II	III	IV
Player B	1	18	4	6	4
	2	6	2	13	7
	3	11	5	17	3
	4	7	6	12	2