



K19U 0126

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.)  
Examination, April 2019  
(2014 Admission Onwards)  
CORE COURSE IN MATHEMATICS  
6B14 MAT : (Elective – A) : Operations Research

Time : 3 Hours

Max. Marks : 48

SECTION – A

All the first 4 questions are **compulsory**. They carry **1 mark each**.

1. Define positive semi definite quadratic form.
2. Define the term feasible solution of a linear programming problem.
3. What is an unbalanced transportation problem ?
4. Define two person zero sum game.

SECTION – B

Answer **any 8** questions from among the questions 5 to 14. These questions carry **2 marks each**.

5. Show that  $S = \{(x_1, x_2) : x_1^2 + x_2^2 \leq 4\}$  is a convex set.
6. Write the quadratic form  $x_1^2 + 2x_2^2 - 7x_3^2 - 4x_1x_2 + 3x_1x_3 - 5x_2x_3$  in the form  $X^TAX$ .
7. Obtain all basic solutions to the following system of linear equations :  
 $x_1 + 2x_2 + x_3 = 4$  :  $2x_1 + x_2 + 5x_3 = 5$ .
8. State the general LPP in the standard form.

P.T.O.



9. Give a mathematical formulation of the transportation problem.
10. Explain loops in transportation tables.
11. Explain the difference between transportation problem and assignment problem.
12. What is no passing rule in a sequencing algorithm ?
13. What are the properties of a game ?
14. Explain the concept of value of the game.

### SECTION – C

Answer **any 4** questions from among the questions **15 to 20**. These questions carry **4 marks each**.

15. Prove that the set of all convex combinations of a finite number of points  $S \subset \mathbb{R}^n$  is a convex set.
16. A firm manufactures two types of products A and B and sells them at a profit of Rs. 2 on type A and Rs. 3 on type B. Each product is processed on two machines G and H. Type A requires 1 minute of processing time on G and 2 minutes on H; type B requires 1 minute on G and 1 minute on H. The machine G is available for not more than 6 hours 40 minutes while machine H is available for 10 hours during any working day. Formulate the problem as a linear programming problem.
17. What are the methods for finding initial basic feasible solution of the transportation problem ? Explain any one.
18. Describe a method of drawing minimum number of lines in the context of assignment problem.
19. What are the main assumptions made while dealing with sequencing problem ?
20. Find the saddle point of the payoff matrix.

$$\begin{pmatrix} 4 & 1 & -3 \\ 3 & 2 & 5 \\ 0 & 1 & 6 \end{pmatrix}$$



SECTION – D

Answer **any 2** questions from among the questions 21 to 24. These questions carry 6 marks **each**.

21. Solve using simplex method :

$$\text{Maximize } Z = 5x_1 + 3x_2$$

$$\text{Subject to } 3x_1 + 5x_2 \leq 15$$

$$5x_1 + 2x_2 \leq 10 \text{ and } x_1 \geq 0, x_2 \geq 0.$$

22. Describe MODI method in transportation problem.

23. Solve the following assignment problem ?

	1	2	3	4
A	49	60	45	61
B	55	63	45	61
C	52	62	49	68
D	55	64	48	66

24. Solve the following  $2 \times 3$  game graphically.

	Player B		
Player A	1	3	11
	8	5	2

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