



B.Tech I Semester Regular/Supplementary Examinations, April 2022

LINEAR ALGEBRA & GRAPH THEORY
(Common to CSE, CSE(AI&ML), CSE(DS) & IT)

Maximum Marks: 70

Date:30.04.2022 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Define rank of a Matrix.
- 2 Compare Gaussian elimination method and Gauss- Jordan method.
- 3 Find the characteristic equation of the matrix $A = \begin{pmatrix} 6 & -2 & 2 \\ -2 & 2 & -1 \\ 2 & -1 & 3 \end{pmatrix}$
- 4 State Cayley Hamilton Theorem and mention its uses.
- 5 Define Skew- Hermitian Matrix.
- 6 Define Unitary matrix.
- 7 When a graph is said to be connected?
- 8 Does there exist a graph with degree sequence 5, 4, 4, 3, 2, 2, 1.
- 9 Define a binary tree.
- 10 State any two properties of a tree.

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 Solve the system of equations $10x - 2y + 3z = 23$, $2x + 10y - 5z = -33$, $3x - 4y + 10z = 41$ by using Gauss elimination method. [10]

OR

- 12 Use Gauss- Jordan method to solve the system of equations:
 $x - 2y + 3z = 9$, $-x + 3y = -4$, $2x - 5y + 5z = 17$ [10]

- 13 Verify Cayley Hamilton theorem and hence find A^{-1} of the matrix. [10]

$$A = \begin{pmatrix} 1 & -1 & 4 \\ 3 & 2 & -1 \\ 2 & 1 & -1 \end{pmatrix}$$

OR

- 14 Reduce the quadratic form $8x_1^2 + 7x_2^2 + 3x_3^2 - 12x_1x_2 - 8x_2x_3 + 4x_3x_1$ to the canonical form through an orthogonal transformation. Also, Find its nature, rank, index and signature. [10]

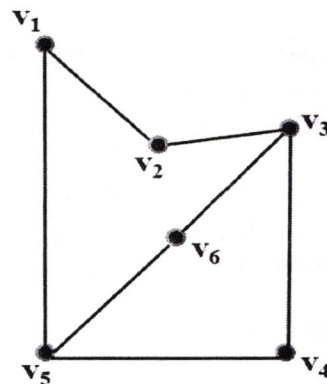
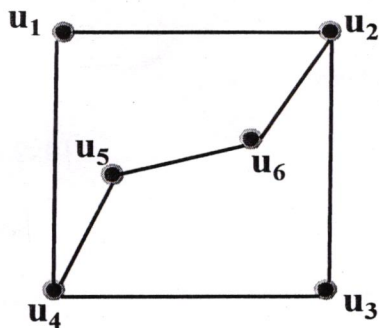
- 15 Decompose the following matrix as the sum of Hermitian and Skew Hermitian matrices. [10]

$$A = \begin{bmatrix} 5i & 1-2i \\ 3 & i \end{bmatrix}$$

OR

- 16 If $A = \begin{bmatrix} 2+i & 3 & -1+3i \\ -5 & i & 4-2i \end{bmatrix}$, then show that AA^* is a Hermitian matrix. [10]

- 17 Find the adjacency matrices of the following graphs and hence test whether they are isomorphic or not. [10]



OR

- 18 Give an example of a graph which is:
 (i) Eulerian but not Hamiltonian [10]
 (ii) Hamiltonian but not Eulerian
 (iii) both Eulerian and Hamiltonian
 (iv) neither Eulerian nor Hamiltonian

- 19 State and Prove Euler's theorem in plane graph. [10]

OR

- 20 Build a minimum spanning tree of the following weighted connected graph. [10]

