



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY  
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 3B1AM

## B.Tech I Year I Semester Regular Examinations, July 2021

### LINEAR ALGEBRA & GRAPH THEORY

(Common to CSE, CSE(AI&ML), CSE(DS) & IT)

Maximum Marks: 70

Date: 12.07.2021 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 symmetric matrix.
- 2 Define upper triangular matrix with an example.
- 3 Find the sum and product of the eigen values of  $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ .
- 4 Find the characteristic polynomial of  $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ .
- 5 Define unitary matrix.
- 6 Define hermitian matrix.
- 7 Define complete graph.
- 8 Draw a complete bipartite graph of  $K_{2,3}$  and  $K_{3,3}$ .
- 9 Define spanning tree.
- 10 Define tree.

#### Part-B

Answer All the following questions.

(10M X 5=50Marks)

- 11 Find the inverse of the matrix  $\begin{pmatrix} 2 & 2 & 3 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{pmatrix}$  by Gauss-Jordan method. (10M)

OR

- 12 Solve the following system of equations, using Gauss elimination method: (10M)

$$x_1 + x_2 + x_3 + x_4 = 2, \quad x_1 + x_2 + 3x_3 - 2x_4 = -6,$$

$$2x_1 + 3x_2 - x_3 + 2x_4 = 7, \quad x_1 + 2x_2 + x_3 - x_4 = -2$$

- 13 Reduce the quadratic form  $2x_1^2 + x_2^2 + x_3^2 + 2x_1x_2 - 4x_2x_3 - 2x_3x_1$  into canonical form through an orthogonal transformation. (10M)

OR

- 14 Verify Cayley –Hamilton theorem and also find  $A^{-1}$  for the matrix  $A = \begin{pmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{pmatrix}$  (10M)

- 15 (i) If  $A = \begin{bmatrix} 3 & 7-4i & -2+5i \\ 7+4i & -2 & 3+i \\ -2-5i & 3-i & 4 \end{bmatrix}$ , show that A is hermitian. (5M)
- (ii) Prove that  $\begin{bmatrix} 3 & 7-4i & -2+5i \\ 7+4i & -2 & 3+i \\ -2-5i & 3-i & 4 \end{bmatrix}$  is skew - hermitian. (5M)

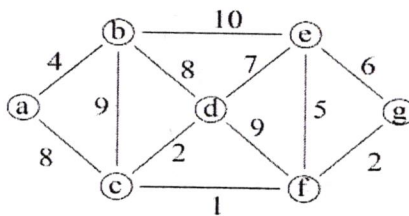
OR

- 16 Find 'c' and 'd' so that the following matrix is unitary:  $\begin{bmatrix} \frac{1}{\sqrt{7}}(1+2i) & c \\ \frac{1}{\sqrt{7}}(1-i) & d \end{bmatrix}$ . (10M)

- 17 Give an example of a graph (i) which is Eulerian but not Hamiltonian (ii) Hamiltonian but not Eulerian (iii) both Eulerian and Hamiltonian (iv) not an Eulerian and not a Hamiltonian. (10M)

OR

- 18 Show that a simple graph G with n vertices is connected if it has more than  $\frac{(n-1)(n-2)}{2}$  edges. (10M)
- 19 Find the minimum spanning tree of the following graph by using Prim's algorithm. (10M)



OR

- 20 Prove that a graph G is tree if and only if it is minimally connected. (10M)