R20 Regulation *Subject code:3B1AM*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech I Semester Supplementary Examinations, April 2023

LINEAR ALGEBRA & GRAPH THEORY

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

Maximum Marks: 70 Date:04.04.2023 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 Show that the system of linear equations $4x + 2y = 7$, $2x + y = 6$ has no solution

3 If A is a square matrix of order 3x3 having eigen values 1,2,-1, then find the trace of the matrix $B = A - A^{-1} + A^2$

4 Find the nature of the Quadratic form $Q = x^2 + 2y^2 + 2z^2 - 2xy + 2xz - 2yz$

5 Define skew Hermitian matrix with an example.

6 Find the Eigen values of $\begin{bmatrix} 4 & 1-3i \\ 1+3i & 7 \end{bmatrix}$

7 Define complete bipartite graph with example.

8 Define planar graph with an example.

9 Define Binary tree.

10 Write about pre-order traversal in trees.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 Find the rank of the matrix by reducing to Normal form where. [10M]

$$A = \begin{bmatrix} 1 & 2 & 3 & -1 \\ 2 & 1 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

OR

12 For what values of μ does the following system of equations possess a nontrivial solution? Obtain the solutions for real values of μ. $3x + y - \mu z = 0; 4x - 2y - 3z = 0; 2\mu x + 4y - \mu z = 0$ [10M]

13 Verify Cayley – Hamilton theorem for $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and find A^{-1} and A^4 [10M]

OR

14 Show that the matrix satisfies Cayley Hamilton theorem and also find the value of the Matrix $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ [10M]

Where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$

15 Solve the differential equation $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} - 14y = 0\,, y(0) = 2, y'(0) = -5$ by Matrix method. [10M]

OR

16 Show that $A = \begin{bmatrix} i & 0 & 0 \\ 0 & 0 & i \\ 0 & i & 0 \end{bmatrix}$ is a Skew Hermitian matrix and also Unitary matrix.Find it's Eigen values and Eigen vectors. [10M]

17 a) State and prove Euler's formula in plane graphs. [5M]

b) Write the conditions to construct dual of the graph and construct dual of the following graph whose adjacency list given. [5M]

vertices	Adjacent vertices
a	b,c
b	a,c,e
c	a,d,e,b
d	c
e	b,c

OR

18 Define i) Cut edge ii) Cut vertex iii) Subgraph iv) Spanning subgraph with examples. [10M]

19 Write prefix, postfix, infix notations of the expression ((x+y)↑2)+((x-4)/3). [10M]

OR

20 a) Write BFS algorithm. [5M]

b) What is the value of postfix 723*-93/+. [5M]