R20 Regulation *Subject code:3B1AM*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, January 2025

LINEAR ALGEBRA & GRAPH THEORY

(Common to CSE, IT, CSE(AIML), CSE(DS))

Maximum Marks: 70 Date:22.01.2025 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)		CO	BTX
1	Define symmetric matrix.	1	L1
2	Define Rank of a matrix	1	L1
3	Determine the nature, index, and signature of the quadratic form $x^2 - 6xy + y^2$.	2	L1
4	Find the nature of quadratic form $2x^2 + 3y^2 - 5z^2 - 4xy + 8xz - 10yz$	2	L1
5	Prove that A=$\begin{bmatrix} 4 & 1+3i \\ 1-3i & 7 \end{bmatrix}$ is Hermitian	3	L1
6	Prove that the matrix $\frac{1}{\sqrt{3}}\begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix}$ is unitary.	3	L1
7	Define complete bipartite graph with example.	4	L1
8	Define dual of a planar graph and explain it through an example	4	L1
9	Define spanning tree	5	L1
10	Define binary tree	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	Find the rank of the matrix by reducing to Echelon form where A = $\begin{bmatrix} 4 & 2 & 3 \\ 8 & 4 & 6 \\ -2 & -1 & -1 \end{bmatrix}$. [10M]	1	L2
	OR		
12	Find the rank of the matrix by reducing to Normal form where [10M]	1	L2

<table>
<tr><td></td><td>$A = \begin{bmatrix} 2 & 3 & 1 & 4 \\ 5 & 2 & 3 & 0 \\ 9 & 8 & 0 & 8 \end{bmatrix}$</td><td></td><td></td></tr>
<tr><td>13</td><td>Determine the Eigen values of A^{-1} where $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ [10M]</td><td>2</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>14</td><td>Determine the Eigen values and Eigen vectors of the following matrices [10M]
$A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$</td><td>2</td><td>L2</td></tr>
<tr><td>15</td><td>Show that the matrix $A=\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ is Skew Hermitian and hence find it's Eigen values and Eigen vectors. [10M]</td><td>3</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>16</td><td>Find the Eigen values and Eigen vectors of $\begin{bmatrix} 4 & 1-3i \\ 1+3i & 7 \end{bmatrix}$ [10M]</td><td>3</td><td>L2</td></tr>
<tr><td>17</td><td>State and Prove Euler's formula in plane graphs [10M]</td><td>4</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>18</td><td>Write the conditions to construct dual of the graph and construct dual of the following graph whose adjacency list given. [10M]
<table>
<tr><td>vertices</td><td>Adjacent vertices</td></tr>
<tr><td>a</td><td>b,c</td></tr>
<tr><td>b</td><td>a,c,e</td></tr>
<tr><td>c</td><td>a,d,e,b</td></tr>
<tr><td>d</td><td>c</td></tr>
<tr><td>e</td><td>b,c</td></tr>
</table></td><td>4</td><td>L2</td></tr>
<tr><td>19</td><td>Write prefix, postfix, infix notations of the expression ((x+y)↑2)+((x-4)/3) [10M]</td><td>5</td><td></td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>20</td><td>Write BFS algorithm with an example. [10M]</td><td>5</td><td></td></tr>
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