R18 Regulation *Subject code:2B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, July 2025

MATHEMATICS-I

(Common to CE, EEE, ME, ECE, CSE & IT)

Maximum Marks: 70 Date:10.07.2025 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)		Marks	CO	BTL
1	Show that the matrix A = $\begin{bmatrix} cos\theta & sin\theta \\ -sin\theta & cos\theta \end{bmatrix}$ is orthogonal	2M	1	L1
2	Define Symmetric and Skew symmetric matrices with examples.	2M	1	L1
3	Find the eigen values of the matrix $\begin{bmatrix} 4 & 1-3i \\ 1+3i & 7 \end{bmatrix}$	2M	2	L1
4	Obtain a quadratic form corresponding to the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 0 & 3 \\ 3 & 3 & 1 \end{bmatrix}$	2M	2	L1
5	State ratio test.	2M	3	L1
6	Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+1}}$	2M	3	L1
7	Verify $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$ for $f = ax^2 + 2hxy + by^2$	2M	4	L1
8	Define chain rule of partial differentiation.	2M	4	L1
9	Evaluate $\int_0^1 \int_1^2 xy \, dx \, dy$	2M	5	L1
10	Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x \, dz \, dx \, dy$	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Find the inverse of the matrix A = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ by Gauss-Jordan method.	10M	1	L2
	OR			
12	Solve the following system of equations $3x + 4y - z - 0w = 0$ $2x + 3y + 2z - 3w = 0$ $2x + y - 14z - 12w = 0$ $X + 3y + 13z + 3w = 0$	10M	1	L2

13	Show that the matrix satisfies Cayley - Hamilton theorem and also find the value of the Matrix $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ Where A = $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$	10M	2	L2
	OR			
14	Reduce the quadratic form to canonical form by an orthogonal reduction and find the Nature, index, signature $2x^2 + 2y^2 + 2z^2 - 2xy + 2xz - xyz$	10M	2	L2
15	Test the convergence of the series $x + \frac{1}{2}\frac{x^3}{3} + \frac{1.3}{2.4}\frac{x^5}{5} + \frac{1.3.5}{2.4.6}\frac{x^7}{7} + \ldots\ldots +$	10M	3	L2
	OR			
16	Show that the series $\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \ldots\ldots +\infty$	10M	3	L2
17	Find the minimum value of $x^2 + y^2 + z^2$ with the constraint $xy + yz + zx = 3a^2$ Using Lagrange's method of multiplies	10M	4	L2
	OR			
18	If $u = \frac{x+y}{x-y}$, $v = \frac{xy}{(x-y)^2}$, verify whether u,v are functionally dependent. If so, find the relation between them.	10M	4	L2
19	Change the order of integration and evaluate $\int_o^a \int_{x^2/4a}^{2\sqrt{ax}} xy\, dy\, dx$	10M	5	L2
	OR			
20	Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz.dy.dx$	10M	5	L2