R25 Regulation *Subject code:5BS1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, June 2026

MATRICES AND CALCULUS

(Common to CE, EEE, ECE, CSE, CSE(AI&ML), CSE(DS) & IT)

Maximum Marks: 60 Date:20.06.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 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 (5X2M=10Marks)		Marks	CO	BTL
1.a	Find the rank of the matrix by reducing to Echelon form $A=\begin{bmatrix}1 & 4 & -2 & 1\\ -2 & -3 & 4 & 3\\ -3 & 3 & 6 & 12\end{bmatrix}$	2M	1	L3
b	State Cayley-Hamilton Theorem.	2M	2	L1
c	Write the geometric representation of Lagrange's Mean Value Theorem.	2M	3	L6
d	State Euler's theorem for homogeneous function in x and y.	2M	4	L1
e	Evaluate the double integral $\int_0^{\pi}\int_0^{asin\theta} r\,dr\,d\theta$.	2M	5	L2

Part-B

Answer All the following questions. **(5X10M=50Marks)**		Marks	CO	BTL
2	a) Determine the rank of a matrix $\begin{bmatrix}0 & 1 & 2 & -2\\ 4 & 0 & 2 & 6\\ 2 & 1 & 3 & 1\end{bmatrix}$ by reducing it to normal form.	5M	1	L3
	b) Find whether the following equations are Consistent, if so Solve them $x+y+z=6, x-y+2z=5, 3x+y+z=8, 2x-2y+3z=7$.	5M		L3
	OR			
3	Solve the system of equations using Gauss-Seidel iteration method $27x+6y-z=85; 6x+15y+2z=72; x+y+54z=110$.	10M	1	L3
4	If $A=\begin{bmatrix}7 & 2 & -2\\ -6 & -1 & 2\\ 6 & 2 & -1\end{bmatrix}$ verify Cayley-Hamilton theorem. Find A^4 and A^{-1} using Cayley-Hamilton theorem.	10M	2	L5

	OR			
5	Reduce the quadratic form $2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx$ to canonical form by orthogonal reduction, and find orthogonal transformation, index and signature, nature of quadratic form.	10M	2	L3
6	a) Verify Rolle's theorem for $f(x) = e^x sinx$ in $[0, \pi]$. b) Obtain the Taylor's series expansion of $sinx$ in powers of $x - \frac{\pi}{4}$.	5M 5M	3	L3 L3
	OR			
7	Trace the curve $y = \frac{8a^3}{x^2+4a^2}$.	10M	3	L2
8	a) If $u = sin^{-1}\left(\frac{x}{y}\right) + tan^{-1}\left(\frac{y}{x}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$. b) If $u = x\, logxy$ where $x^3 + y^3 + 3xy = 1$ find $\frac{dy}{dx}$.	5M 5M	4	L3 L2
	OR			
9	Examine for minimum and maximum values of $sinx + siny + \sin(x + y)$.	10M	4	L4
10	By changing the order of integration evaluate the double integral $\int_0^1 \int_{x^2}^{2-x} xy\, dy\, dx$.	10M	5	L5
	OR			
11	Find the volume of tetrahedron bounded by the co-ordinate planes and the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$.	10M	5	L5