R20 Regulation *Subject code:3B1AF*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B. Tech I Semester Supplementary Examinations, June 2026

LINEAR ALGEBRA & APPLIED CALCULUS

(Common to EEE & MECH)

Maximum Marks: 70 Date: 16.06.2026 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 (10X2M=20 Marks)		Marks	CO	BTL
1	State the conditions to find the consistency of system of homogeneous equations.	2M	1	L1
2	Define orthogonal matrix.	2M	1	L1
3	If A is a square matrix of order 3x3 having eigen values 1,2,-1, then find the eigen values of A^{-1} ,A^2	2M	2	L1
4	Find the nature of quadratic form $2x^2 + 3y^2 - 5z^2 - 4xy + 8xz - 10yz.$	2M	2	L1
5	Evaluate $\int_0^{\pi/2}\int_0^{\pi/2} dxdy.$	2M	3	L1
6	Find the limits of the integration where the region bounded by the x-axis, ordinate at x = 2a and the parabola x^2 =4ay	2M	3	L1
7	State Rolle's mean value theorem.	2M	4	L1
8	Define Beta and Gamma functions.	2M	4	L1
9	If u=e^x, find $\frac{\partial^2 u}{\partial y \partial x}$.	2M	5	L1
10	If x = r cosθ ,y = r sinθ then find $\frac{\partial(r,\theta)}{\partial(x,y)}$.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
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 $A=\begin{bmatrix}2 & 3 & 1 & 4\\5 & 2 & 3 & 0\\9 & 8 & 0 & 8\end{bmatrix}$	10M	1	L2
13	Determine the Eigen values and Eigen vectors of the following matrices. $A=\begin{bmatrix}1 & 1 & 1\\-1 & -3 & -3\\2 & 4 & 4\end{bmatrix}$	10M	2	L2
	OR			
14	Determine the Eigen values and Eigen vectors of the following matrices. $A=\begin{bmatrix}3 & 1 & 4\\0 & 2 & 6\\0 & 0 & 5\end{bmatrix}$.	10M	2	L2
15	By changing the order of integration, evaluate $\int_0^1 \int_1^{2-x} xydxdy$	10M	3	L2
	OR			
16	Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x+y)\,dxdy.$	10M	3	L2
17	Verify Rolle's mean value theorem for the function $f(x)=log\frac{x^2+ab}{x(a+b)}$ in[a,b];a>0,b>0.	10M	4	L2
	OR			
18	S.T $\beta(m,n)=\int_0^{\infty}\frac{x^{n-1}}{(1+x)^{m+n}}dx$	10M	4	L2
19	If $x=e^r sec\theta$, $y=e^r tan\theta$ then prove that $JJ^I=1$	10M	5	L2
	OR			
20	Determine whether u = sinx + siny ; v = sin(x+y) are functionally dependent or not.	10M	5	L2