



R20 Regulation *Subject code:3B1AF*
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
 (Autonomous, Accredited by NAAC with 'A+' Grade)

B. Tech I Semester Supplementary Examinations, January 2026

LINEAR ALGEBRA & APPLIED CALCULUS
(Common to EEE & ME)

Maximum Marks: 70

Date: 05.01.2026

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	Define Rank of a matrix		2M	1	L1
2	Define symmetric 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 $\int_0^{\pi/2} \int_0^{\pi/2} dx dy.$		2M	3	L1
6	Evaluate $\int_0^1 \int_0^2 (x^2 + y^2) dy dx$		2M	3	L1
7	State Rolle's mean value theorem.		2M	4	L1
8	Define Beta and Gamma functions.		2M	4	L1
9	If $f = x^2 + y^2$, then $\frac{\partial^2 f}{\partial x \partial y}.$		2M	5	L1
10	Write the sufficient condition's for the existence of maxima & minima of $f(x,y).$		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	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	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	Find the area of the region bounded by $y^2 = 4ax$ and $x^2 = 4ay$	10M	3	L2
	OR			
16	Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{\infty} \frac{r}{(a^2+r^2)^2} dr d\theta$	10M	3	L2
17	Find c of Cauchy's mean value theorem for $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{\sqrt{x}}$ in $[a,b]$ $0 < a < b$.	10M	4	L2
	OR			
18	S.T $\beta(m, n) = \frac{\Gamma m \Gamma n}{\Gamma m+n}$; where $m > 0; n > 0$.	10M	4	L2
19	If $u = xy + yz + zx$, $v = x^2 + y^2 + z^2$, $w = x + y + z$ then show that the functions are functionally dependent and hence find the relation between them.	10M	5	L2
	OR			
20	Find the extreme values of $f(x, y) = \sin x + \sin y + \sin(x + y)$.	10M	5	L2