R20 Regulation *Subject code:3B1AJ*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B. Tech I Semester Supplementary Examinations, June 2026

LINEAR ALGEBRA CALCULUS & ORDINARY DIFFERENTIAL EQUATIONS

(ECE)

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	Prove that if λ is an Eigen value of an orthogonal matrix then $\frac{1}{\lambda}$ is also an Eigen value.	2M	1	L1
2	Find the rank of the matrix A=$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$	2M	1	L1
3	Find the nature of the Quadratic form $Q = x^2 + 2y^2 + 2z^2 - 2xy + 2xz - 2yz$.	2M	2	L1
4	If A is a square matrix of order 3x3 having eigen values 1,2,-1, then find the trace of the matrix $B = A - A^{-1} + A^2$	2M	2	L1
5	Find I. F. of $2xydy - (x^2 + y^2 + 1)dx = 0$	2M	3	L1
6	State law of Natural growth.	2M	3	L1
7	Solve $(D^3+3D^2+3D+1)Y = 0$	2M	4	L1
8	Write the working rule of Method of Variation of Parameters.	2M	4	L1
9	Find the value of the integral $\iint 2x\,dx\,dy$ over the triangle consists of vertex points A(0,0), B(1,0) and C(0,1).	2M	5	L1
10	Find the value of the integral $\int_0^\infty \int_0^\infty e^{-x^2(1+y^2)} x\,dx\,dy$	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 $A = \begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 5 \\ -1 & -2 & 6 & 7 \end{bmatrix}$	10M	1	L2

	OR			
12	Solve 2x – y + 3z =0; 3x + 2y + z = 0 ; x – 4y + 5z =0	10M	1	L2
13	Reduce the quadratic form to canonical form $3x^2 - 3y^2 - 5z^2 - 2xy - 6yz - 6xz$	10M	2	L2
	OR			
14	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
15	An object whose temperature is 75^0c cools in an atmosphere of constant temperature 25^0c at the rate $k\theta$,θ being the excess temperature of the body over the temperature, if after 10 minutes the temperature of the object falls to 65^0c,find its temperature after 20 minutes, find the time required to cool down to 55^0c	10M	3	L2
	OR			
16	Solve $y(1 + xy)dx + x(1 - xy)dy = 0$	10M	3	L2
17	Solve by the method of variation of parameters $(D^2 + a^2)y = tanax$	10M	4	L2
	OR			
18	$Solve(D^2 - 4D + 3)y = sin3xcos2x$	10M	4	L2
19	Evaluate $\iint(x^2 + y^2)dxdy$ in the positive quadrant for which x+y≤1	10M	5	L2
	OR			
20	Evaluate $\iint y^2 dxdy$ where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$	10M	5	L2