R20 Regulation *Subject code:3B1AJ*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B. Tech I Semester Supplementary Examinations, January 2026

LINEAR ALGEBRA CALCULUS & ORDINARY DIFFERENTIAL EQUATIONS

(ECE)

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	Show that the system of linear equations $4x + 2y = 7$, $2x + y = 6$ has no solution	2M	1	L1
2	For which value of 'λ' the rank of the matrix $A = \begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ \lambda & 13 & 10 \end{bmatrix}$ is 2.	2M	1	L1
3	Define index, signature of a quadratic form	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 $(D^2+6D+9)Y = 2e^{-3x}$	2M	4	L1
8	Solve $(2D^2 - 13D + 15)y = 0$	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	Verify Canley – 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	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	$Solve(D^3 - 6D^2 + 11D - 6)y = e^{-2x} + e^{-3x}$	10M	4	L2
	OR			
18	*Solve by the method of variation of parameter* $(D^2 - 2D)y = e^x sinx$	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