R22 Regulation *Subject code:4B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, January 2026

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

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

Maximum Marks: 60 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 (10X1M=10 Marks)		Marks	CO	BTL
1.a	Define Hermitian matrix.	1M	1	L1
b	Define an orthogonal matrix.	1M	1	L1
c	What is meant by the spectrum of the square matrix.	1M	2	L1
d	Define signature of quadratic form.	1M	2	L1
e	*Find* $\frac{\partial M}{\partial y}$ of $(e^y + 1)\cos x\,dx + e^y \sin x\,dy = 0$.	1M	3	L1
f	State law of Natural growth	1M	3	L1
g	Solve $(D^2 + 1)y=0$. where $D=\frac{d}{dx}$.	1M	4	L1
h	Find **P.I** of $(D^2 + 9)y= x$. where $D=\frac{d}{dx}$.	1M	4	L1
i	Find $\int_0^1 \int_0^x e^{\frac{y}{x}}\,dydx$	1M	5	L1
j	Find the value of $\int_0^1 \int_1^2 xy\,dydx$	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Find singular matrices P and Q such that PAQ is the normal form hence find the rank of A. Where $= \begin{bmatrix} 1 & 1 & 1 & 2 \\ 3 & -3 & 1 & 2 \\ 2 & 1 & -3 & -6 \end{bmatrix}$.	10M	1	L2
	OR			
3	Solve the following system of linear equations for the unknown angles α, β and γ where $0 \le \alpha \le 2\pi, 0 \le \beta \le 2\pi$ and $0 \le \gamma < \pi$ $2\sin\alpha - \cos\beta + 3\tan\gamma = 3$ $4\sin\alpha + 2\cos\beta - 2\tan\gamma = 2$ $6\sin\alpha - 3\cos\beta + \tan\gamma = 9$.	10M	1	L2
4	Verify Cayley-Hamilton theorem for the following matrix and hence find A^{-1} and A^4	10M	2	L2

	Where A= $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$.			
	OR			
5	Determine the nature ,index and signature of the following quadratic form $x^2_1+5\,x^2_2+x^2_3+2x_2x_3+6x_3x_1+2x_1x_2$.	10M	2	L2
6	Solve $(2xy+y-\tan y)\,dx+(x^2-x\tan^2 y+\sec^2 y)dy=0$.	10M	3	L2
	OR			
7	Find the orthogonal trajectories of the family of curve $r = a(1-\cos\theta)$ where a is the parameter.	10M	3	L2
8	$Solve(D^3+2D^2+D)y = e^{2X}+x^2+x+sin2x$	10M	4	L2
	OR			
9	$Solve\ (D^2+a^2)y = tanax$ *by the method of variation of parameter.*	10M	4	L2
10	By changing the order of integration, evaluate $\int_0^1 \int_1^{2-x} xydxdy$	10M	5	L2
	OR			
11	Evaluate $\iint r^3 drd\theta$ over the area included between the circles $r = 2\sin\theta$ and $r = 4\sin\theta$.	10M	5	L2