R22 Regulation *Subject code:4B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, June 2026

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

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

Maximum Marks: 60 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 20 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	Define signature of a quadratic form	1M	2	L1
d	Express the following quadratic form into matrix notation. $2x^2 + 3y^2 - 5z^2 - 2xy + 6xz - 10yz$	1M	2	L1
e	check whether the D.E. is exact or not $(y^2 - x^2)dx + 2xydy = 0$	1M	3	L1
f	State Newton's law of cooling	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	Evaluate $\int_0^{\pi/2}\int_0^{\pi/2} \sin(x+y)\,dxdy$.	1M	5	L1
j	Evaluate $\int_0^1\int_0^2 (x^2+y^2)dy\,dx$	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	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
	OR			

3	Investigate for what values of k the equations $x + y + z = 1$; $2x + y + 4z = k$; $4x + y + 10z = k^2$ have infinite number of solutions.	10M	1	L2
4	Determine the Eigen values and Eigen vectors of the following matrix. $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$	10M	2	L2
	OR			
5	Reduce the quadratic form to canonical form $3x^2 - 3y^2 - 5z^2 - 2xy - 6yz - 6xz$;	10M	2	L2
6	A Bacterial culture, growing exponentially, increases from 100 to 400 grams in 10 hours. How much was present after 3 hours	10M	3	L2
	OR			
7	Prove that the system of confocal conics $\frac{x^2}{a^2+\lambda} + \frac{y^2}{b^2+\lambda} = 1$, where λ is a parameter is self-orthogonal.	10M	3	L2
8	*Solve* $(D^3 + 2D^2 + D)y = e^{2x} + x^2 + x + sin2x$	10M	4	L2
	OR			
9	*Solve by the method of variation of parameter* $(D^2 - 2D)y = e^x sinx$	10M	4	L2
10	By changing in to polar coordinates evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dxdy$	10M	5	L2
	OR			
11	Find the area of the region bounded by $y^2 = 4ax$ and $x^2 = 4ay$	10M	5	L2