R22 Regulation *Subject code:4B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, July 2025

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

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

Maximum Marks: 60 Date:10.07.2025 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	What is the value of the "K" if the rank of the matrix $\begin{bmatrix}1 & 2 & 3\\ 2 & K & 7\\ 3 & 6 & 10\end{bmatrix}$ is 2 ?	1M	1	L1
b	Find the value of 'a' for which the equations have infinite number of solutions: $x+y=z=1; ax-ay+3z=5; 5x-3y+az=6.$	1M	1	L1
c	If the Eigen values of $A=\begin{bmatrix}5 & -2 & 2\\ -2 & 6 & 2\\ 0 & 2 & 7\end{bmatrix}$ are 3,6 and 9, then what are the Eigen values of adj A?	1M	2	L1
d	Find the nature of the quadratic form $2x^2+2y^2+2z^2+2yz.$	1M	2	L1
e	Solve $x\,dx+y\,dy=\frac{x\,dy+y\,dx}{x^2+y^2}$.	1M	3	L1
f	State Newton's Law of Cooling.	1M	3	L1
g	Find the particular integral value of $(D^2-4D+13)y=e^{2x}.$	1M	4	L1
h	Find the general solution of $y''+2y'=0.$	1M	4	L1
i	Evaluate $\int_0^2\int_0^x e^{x+y}\,dy\,dx.$	1M	5	L1
j	Find the area lying between the parabola $y=4x-x^2$ and the line $y=x.$	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Use Gauss -Jordan method to find the inverse of the matrix $\begin{bmatrix}-1 & 2 & 2\\ 2 & -1 & 2\\ 2 & 2 & -1\end{bmatrix}$.	5M	1	L2
	b) Find the values of a and b for which the equations $x+3y+z=a; x+2y+2z=b; x+5y+3z=9$ are consistent. When will this equation have a unique solution?	5M		
	OR			
3	a) Test for consistency and if possible, solve the following systems of equations. $2x-y+z=2; 6x-3y+3z=6; 4x-2y+2z=4.$	5M	1	L2

	b) Find the rank of the matrix $\begin{bmatrix} 4 & 0 & 2 & 1 \\ 2 & 1 & 3 & 4 \\ 2 & 3 & 4 & 7 \\ 2 & 3 & 1 & 4 \end{bmatrix}$ by Echelon form.	5M		
4	a)Find the Eigen values and Eigen vectors of the matrix A, Where $A = \begin{bmatrix} 1 & 3 & 4 \\ 0 & 2 & 5 \\ 0 & 0 & 3 \end{bmatrix}$. b) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$, find A^4.	5M 5M	2	L2
	OR			
5	Reduce the quadratic form $5x^2 + 26y^2 + 10z^2 + 6xy + 4yz + 14zx$ to canonical form by orthogonal reduction, and find orthogonal transformation, index and signature, Nature of quadratic form.	10M	2	L2
6	If the temperature of the air is 20^0C and the temperature of the body drops from 100^0C to 80^0C in 10 minutes. What will be its temperature after 20 minutes. When will be the temperature 40^0C.	10M	3	L2
	OR			
7	Solve $y(1 + xy)dx + x(1 - xy)dy = 0$.	10M	3	L2
8	Solve the equation $(D^2 - 2D + 2)y = e^x tanx$ by the method of variation of parameters.	10M	4	L2
	OR			
9	Solve the differential equation $(D^2 + 4)y = sec2x$ by the method of variation of parameters.	10M	4	L2
10	Evaluate by Changing the order of integration $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x\,dy\,dx}{\sqrt{x^2+y^2}}$.	10M	5	L2
	OR			
11	Using double integration determine the area of the region bounded by the curves $y^2 = 4ax, x + y = 3a$ and $y = 0$.	10M	5	L2