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 2024

LINEAR ALGEBRA AND ORDINARY DIFFRENTIAL EQUATIONS

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

Maximum Marks: 60 Date:25.06.2024 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)	CO No.	Bloom Tx
1.	a	Define orthogonal matrix.	1	1
	b	State the conditions to find the consistency of system of non-homogeneous equations.	1	1
	c	Find the quadratic form corresponding to the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 3 & 3 & 1 \end{bmatrix}$.	2	1
	d	Find the sum of the eigen values of the matrix $A = \begin{bmatrix} 2 & 5 & 7 \\ 1 & 4 & 6 \\ 2 & -2 & 3 \end{bmatrix}$	2	1
	e	Define orthogonal trajectories.	3	1
	f	Write the condition for exact differential equation?	3	1
	g	Solve $(D^2 - 4D + 4)y = 0$.	4	1
	h	Find the P.I for the equation $(D^2 + 5D + 6)y = e^x$.	4	1
	i	Evaluate $\int_1^3 \int_0^1 xy^2 dxdy$.	5	1
	j	Evaluate $\int_0^{\pi} \int_0^{a\,sin\theta} r\, dr\, d\theta$.	5	1

Part-B

		Answer All the following questions. (5X10M=50Marks)		
2		Find the rank of the matrix by reducing to Normal form where	1	2

	$A=\begin{bmatrix}1 & 2 & 3 & -1\\ 2 & 1 & 3 & 1\\ 1 & 0 & 1 & 1\\ 0 & 1 & 1 & 1\end{bmatrix}$ [10]	1	2
	OR		
3	Express the following system in matrix form and solve by Gauss Elimination method. $2x_1 + x_2 + 2x_3 + x_4 = 6$; $6x_1 - 6x_2 + 6x_3 + 12x_4 = 36$; $4x_1 + 3x_2 + 3x_3 - 3x_4 = -1$; $2x_1 + 2x_2 - x_3 + x_4 = 10$. [10]	1	2
4	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 [10]	2	2
	OR		
5	Reduce the following quadratic form to canonical form by orthogonal transformation $Q = 3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2xz$. [10]	2	2
6	The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What would be the value of N after $1\frac{1}{2}$ hours ? [10]	3	2
	OR		
7	a) Solve $x\frac{dy}{dx} + y = x^3y^6$. [5] b) Find the orthogonal trajectories of the family of curves $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$, *where* a is the parameter. [5]	3	2
8	Solve by the method of variation of parameters $(D^2 + a^2)y = tanax$ [10]	4	2
	OR		
9	$Solve(D^2 - 4D + 3)y = sin3xcos2x$ [10]	4	3
10	Evaluate $\iint r^3 dr d\theta$ over the area included between the circles r = 2sinθ and r = 4sinθ. [10]	5	3
	OR		
11	Find the area of the region bounded by $y^2 = 4ax$ and $x^2 = 4ay$ [10]	5	3