R22 Regulation

Subject code: 4B1AA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Regular/Supplementary Examinations, January 2024

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

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

Maximum Marks: 60 Date:18.01.2024 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	Bloom Tx
1.	a	Define Hermitian and Skew-Hermitian.	CO1	L2
	b	When the equation $AX = B$has a unique solution and no solution.	CO1	L2
	c	Find the eigenvalues of a matrix$A = \begin{bmatrix} 1 & 1 \\ 2 & 5 \end{bmatrix}$.	CO2	L1
	d	Write the matrix relating to the quadratic form $ax^2 + 2hxy + by^2$.	CO2	L2
	e	Solve $x\frac{dy}{dx} - y = x^2$	CO3	L2
	f	State Law of Natural Growth and Decay.	CO3	L2
	g	Find the Wronskian of x and e^x	CO4	L2
	h	Find the particular integral of $\frac{1}{D^2+4}\sin 2x$	CO4	L1
	i	Evaluate $\int_0^5 \int_0^3 x(x^2 + y^2)\, dydx$	CO5	L2
	j	Evaluate $I = \int_2^1 \int_1^2 xy\, dydx$	CO5	L2

Part-B

	Answer All the following questions. (5X10M=50Marks)		
2	A. Find the rank of $\begin{bmatrix} 1 & 4 & 3 & -2 & 1 \\ -2 & -3 & -1 & 4 & 3 \\ -1 & 6 & 7 & 2 & 9 \\ -3 & 3 & 6 & 6 & 12 \end{bmatrix}$ reducing to echelon form. [5M]	CO1	1,2
	B. Discuss for what values of λ, μ the simultaneous equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. [5M]		6

	OR		
3	A. Find the inverse of $A = \begin{bmatrix} -2 & 1 & 3 \\ 0 & -1 & 1 \\ 1 & 2 & 0 \end{bmatrix}$ using Gauss Jordon method. [5M] B. Determine whether the following equations have a non-trivial solution, if so solve them: $x + 2y + 3z = 0, 3x + 4y + 4z = 0, 7x + 10y + 12z = 0$. [5M]	CO1	3
4	Verify Cayley-Hamilton theorem for the following matrix and hence find A^{-1} and A^4 where $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ [10M]	CO2	3
	OR		
5	Reduce the Quadratic form to a canonical form by an orthogonal reduction and discuss its rank, nature, index and signature $x^2 + 5y^2 + z^2 + 2xy + 2yz + 6zx$. [10M]	CO2	3
6	A. Solve $x\frac{dy}{dx} + y = x^3y^6$. [5M] 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. [5M]	CO4	3
	OR		
7	A. Solve $(x + 1)\frac{dy}{dx} - y = e^{3x}(x + 1)^2$. [5M] B. Show that the family of parabolas $x^2 = 4a(y + a)$ is self-orthogonal. [5M]	CO3	5,6
8	A. Solve $(D^2 + 2D + 2)y = e^{-x} + \sin 2x$. [5M] B. Solve $(D^3 - 3D - 2)y = x^2$. [5M]	CO4	3
	OR		
9	Solve by the method of variation of parameters $(D^2 - 2D)y = e^x sinx$ [10M]	CO4	3
10	A. Evaluate $\iint y\, dx\, dy$ over the region R, where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$. [5M] B. Evaluate $\iint r^2 \sin\theta\; dr\, d\theta$ over the semi-circle $r = 2a\cos\theta$ above the initial line. [5M]	CO5	5
	OR		
11	By Changing the order of integration, evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dydx$ [10M]	CO5	5