R20 Regulation *Subject code:3B1AJ*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, July 2025

LINEAR ALGEBRA CALCULUS & ORDINARY DIFFERENTIAL EQUATIONS

(ECE)

Maximum Marks: 70 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 (10X2M=20 Marks)		Marks	CO	BTL
1	Find the rank of the matrix A=$\begin{bmatrix}1 & 1 & 1\\ 1 & -1 & 0\\ 1 & 1 & 1\end{bmatrix}$	2M	1	L1
2	Define symmetric matrix.	2M	1	L1
3	If 'λ' is an Eigen value of the matrix A then 'λ' is also an Eigen value of A^T	2M	2	L1
4	Express the following quadratic form matrix notation $2x^2 + 3y^2 - 5z^2 - 2xy + 6xz - 10yz$	2M	2	L1
5	check whether the D.E. is exact or not $(y^2 - x^2)dx + 2xydy = 0$	2M	3	L1
6	State Newton's law of cooling	2M	3	L1
7	Find the P.I. of $(D^2 + 9)y = cos3x$	2M	4	L1
8	Write the working rule of finding particular Integral of f(D)y= e^{ax}	2M	4	L1
9	Find the limits of the integration where the region bounded by the x-axis, ordinate at x = 2a and the parabola x^2 =4ay.	2M	5	L1
10	Change the order of integral $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y}\, dydx$.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	a)Find the rank of the matrix by reducing to Echelon form where A = $\begin{bmatrix}4 & 2 & 3\\ 8 & 4 & 6\\ -2 & -1 & -1.5\end{bmatrix}$	5M	1	L2
	b) Solve 2x – y + 3z =0; 3x + 2y + z = 0 ; x – 4y + 5z =0. (5 marks)	5M		
	OR			
12	Find non-singular matrices P and Q such that PAQ is in normal form. Also find the rank of the matrix A = $\begin{bmatrix}1 & 2 & 3\\ 2 & -1 & 0\\ 3 & 1 & 2\end{bmatrix}$	10M	1	L2

13	Determine the Eigen values and Eigen vectors of the following matrices; $A = \begin{bmatrix} 1 & 1 & 1 \\ -1 & -3 & -3 \\ 2 & 4 & 4 \end{bmatrix}$	10M	2	L2
	OR			
14	Reduce the following quadratic form to canonical form by orthogonal transformation $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2xz$;	10M	2	L2
15	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			
16	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
17	$Solve(D^3 + 2D^2 + D)y = e^{2x} + x^2 + x + sin2x$	10M	4	L2
	OR			
18	$Solve(D^2 + 2D - 3)y = x^2e^{-3x}$	10M	4	L2
19	Evaluate $\iint (x + y)dxdy$ over the region in the positive quadrant bounded By the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	10M	5	L2
	OR			
20	Evaluate $\int_0^1 \int_x^{\sqrt{2x-x^2}} (x^2 + y^2)\ dx\ dy$ by changing into polar coordinates.	10M	5	L2