R20 Regulation *Subject code:3B1AJ*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, April 2023

LINEAR ALGEBRA CALCULUS & ORDINARY DIFFERENTIAL EQUATIONS

(ECE)

Maximum Marks: 70 Date:04.04.2023 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)

1 State the conditions to find the consistency of system of non-homogeneous equations.

2 For which value of 'λ' the rank of the matrix $A = \begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ \lambda & 13 & 10 \end{bmatrix}$ is 2.

3 If A is an upper triangular matrix of order 3x3 having eigen values 1,2,-1, then find the trace of the matrix A.

4 Determine the nature, index, and signature of the quadratic form $x^2 - 6xy + y^2$

5 Define exact differential equation

6 Define Bernoulli Differential equation

7 Solve $(D^2 - 2D + 4)\, y = 0$

8 Find P.I of $(D^2+6D+9)y = 2e^{-3x}$

9 Find the value of the integral $\int_0^2 \int_0^y e^{-x}$ dx dy

10 Evaluate $\int_0^1 \int_0^2 (x^2 + y^2) dy\, dx$

Part-B

Answer All the following questions. (5X10M=50Marks)

11 Investigate for what values of α *and* β the equations $x + 2y + z = 8$; $2x + 2y + 2z = 13$; $3x + 4y + \alpha z = \beta$. Have i) no solution ii) unique solution iii) many solutions. [10M]

OR

12 For what values of μ does the following system of equations possess a nontrivial solution? Obtain the solutions for real values of μ. $3x + y - \mu z = 0; 4x - 2y - 3z = 0; 2\mu x + 4y - \mu z = 0$. [10M]

13 Verify Cayley – Hamilton theorem for $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and find A^{-1} [10M]

OR

14 Show that the matrix satisfies Cayley Hamilton theorem and also find the value of the Matrix $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$

Where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ [10M]

15 Solve$(1 + y^2) + \left(x - e^{tan^{-1}y}\right)\frac{dy}{dx} = 0$ [10M]

OR

16 Find orthogonal trajectories of the family of circles $x^2 + y^2 + 2gx + c = 0$ [10M]

17 $Solve(D^3 - 6D^2 + 11D - 6)y = e^{-2x} + e^{-3x}$ [10M]

OR

18 $Solve(D^2 + 2D - 3)y = x^2e^{-3x}$ [10M]

19 By change the order of integration, evaluate $\int_0^3 \int_1^{\sqrt{4-y}} (x + y)dxdy$. [10M]

OR

20 Evaluate $\int_0^1 \int_x^{\sqrt{2x-x^2}} (x^2 + y^2)\ dx\ dy$ by changing into polar coordinates. [10M]