R22 Regulation *Subject code: 4B1AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Regular Examinations, April 2022

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

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

Maximum Marks: 60 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 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)

1. a Define orthogonal matrix.
   b Show that the system of linear equations $4x + 2y = 7$, $2x + y = 6$ has no solution.
   c Find the sum and product of the eigenvalues of the matrix $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$
   d State the Cayley-Hamilton theorem.
   e Define Orthogonal trajectories.
   f State Newton's law of cooling.
   g Solve$(D^2 - 4D - 1)y = 0$.
   h Find the particular integral of $(D + 1)^2 y = x$
   i Find the value of the integral $\int_0^1 \int_0^1 dx\, dy$
   j Evaluate $\int_0^1 \int_0^2 x + y \; dxdy$

Part-B

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

2 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]

OR

3 a) Find inverse of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ using Gauss Jordon method. [5M]

b) Determine whether the following equations have a non-trivial solution, if so solve them: $4x + 2y + z + 3w = 0$, $6x + 3y + 4z + 7w = 0$, $2x + y + w = 0$. [5M]

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

OR

5 Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to canonical form and also find its rank, index and signature. [10M]

6 Solve $3\frac{dy}{dx} - ycosx = y^4(sin2x - cosx)$ [10M]

OR

7 A copper ball is heated to a temperature of 80°C. Then at time t=0 it is placed in water which is maintained at 30°C. If at t=3minutes, the temperature of the ball is reduced to 50°C.find the time at which the temperature of the ball is 40°C. [10M]

8 Solve the differential equation$(D^2 - 4D + 4)y = 8x^2e^{2x}sin2x$ [10M]

OR

9 Apply the method of variation of parameters to solve $(D^2 + a^2)y = \tan ax.$ [10M]

10 Evaluate $\iint_R y\,dx\,dy$ when Ris the region bounded by y-axis ,the curve $y=x^2$ and the line x +y=2 in the first quadrant. [10M]

OR

11 By changing order of integration, evaluate $\int_0^3 \int_1^{\sqrt{4-y}} (x + y)\,dx\,dy.$ [10M]