H.T.No. | | | | | | | | | | |

Code No: MA2501 **GEC-R17**

I B. Tech I Semester Regular Examinations, December 2017

LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

(Common to Civil Engineering, Electrical and Electronics Engineering, Mechanical Engineering and Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B.** All Questions carry equal Marks.

PART-A

6 × 2 = 12M

1. Find the rank of the matrix A = $\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$
2. Find the Eigen values of $A^{-1} - 3I$, if A = $\begin{bmatrix} 4 & -3 \\ 2 & 9 \end{bmatrix}$
3. Find the orthogonal trajectory of r = aθ.
4. Find $\frac{1}{D^2 + D + 3}\sin x$
5. If x = r cosθ, y = r sinθ then find $\frac{\partial(x,y)}{\partial(r,\theta)}$.
6. Solve $y\,p + x\,q = x\,y$.

PART-B

4 × 12 = 48M

1. a) Find the rank of the matrix A = $\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ by reducing to normal form. (6M)

   b) Examine whether the following system of equations are consistent. If consistent, solve. 3x + 3y + 2z = 1, x + 2y = 4, 10y + 3z = -2, 2x – 3y – z = 5. (6M)

2. Find the characteristic values and characteristic vectors of the matrix A = $\begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$ (12M)

3. a) Find the orthogonal trajectories of the family of confocal conics $\frac{x^2}{a^2} + \frac{y^2}{b^2 + \lambda} = 1$, where λ is a parameter. (6M)

   b) A body is originally at $90^0 c$ cools down to $70^0 c$ in 20 minutes. The temperature of the air is $40^0 c$. What will be the temperature of the body after 33 minutes? (6M)

4. Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^x \sin x$. (12M)

5. a) If u = 3x + 2y – z, v = x – 2y + z and w = x + 2y - z, then find the Jacobian. (5M)

   b) In a plane triangle , find the maximum value of CosA.CosB.CosC. (7M)

6. a) Form the differential equation by eliminating a and b from log(az-1) = x + ay + b. (4M)

   b) Solve $(x^3 + 3xy^2)p + (y^3 + 3yx^2)q = 2(x^2 + y^2)z$. (8M)

*****