Hall Ticket No | | | | | | | | | | Question Paper Code: AHS002

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech I Semester Supplementary Examinations - July, 2018

Regulation: IARE – R16

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

Time: 3 Hours **(Common to All Branches)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Find Rank of the Matrix A = $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$ by reducing it into Normal form. **[7M]**

   (b) Solve 10x+3y+4z=15, 2x-10y+3z=5, 3x+2y-10z=-10 by LU-decomposition method. **[7M]**

2. (a) Prove that every square matrix can be uniquely expressed as a sum of a symmetric and a skew-symmetric matrix. **[7M]**

   (b) Using Gauss-Jordan method, find the inverse of the matrix A = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$. **[7M]**

UNIT – II

3. (a) Find the Eigen values and Eigen vectors of the Matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. **[7M]**

   (b) By using Cayley Hamilton Theorem find inverse of the Matrix, A = $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$. **[7M]**

4. (a) Find a Matrix P which transforms the Matrix A = $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to the diagonal form. Hence calculate A^4. **[7M]**

(b) Find the Characteristic equation of the matrix A = $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and find the value of $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$. **[7M]**

UNIT – III

5. (a) Solve $3x\left(1-x^2\right)y^2 \; + \left(2x^2-1\right)y^3 = ax^3$ **[7M]**

   (b) A body originally at 80^0C cools down to 60^0C in 20 minutes, the temperature of the air being 40^0C. What will be the temperature of the body after 40 minutes from the original?. **[7M]**

6. (a) Find the Orthogonal Trajectories of the Cardioids $r = a(1-\cos(\theta))$. **[7M]**

   (b) The number N of bacteria in a culture grew at a rate propotional to N. The value of N was initially 100 and increased to 332 in one hour. What would be the value of N after 2 hrs. **[7M]**

UNIT – IV

7. (a) Solve $\left(D^2+D+1\right)y = (1-e^x)^2$. **[7M]**

   (b) Solve by using variation of parameters $\left(D^2-6D+9\right)y = e^{3x}/x^2$. **[7M]**

8. (a) Solve $\left(D^2-4\right)y = xsinhx$. **[7M]**

   (b) The differential equation of an electric circuit is given by $L\frac{d^2i}{dt^2} + \frac{i}{C} = 0$, find the current flow in the circuit at any time, t where L and C are constants. **[7M]**

UNIT – V

9. (a) Verify the Lagranges Mean value for $f\left(x\right) = x\left(x-1\right)\left(x-2\right) in \left(0,1/2\right)$. **[7M]**

   (b) If u=xyz, $v = x^2+y^2+z^2$, w = x+y+z find $\frac{\partial(x,y,z)}{\partial(u,v,w)}$. **[7M]**

10. (a) Discuss the maxima and minima of $f\left(x,y\right) = x^3y^2\left(1-x-y\right)$. **[7M]**

    (b) If u= $sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan\ u$ **[7M]**