Hall Ticket No | | | | | | | | | | | Question Paper Code:AHSC02

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech I SEMESTER END EXAMINATIONS (REGULAR) - APRIL 2022

Regulation:UG-20

LINEAR ALGEBRA AND CALCULUS

Time: 3 Hours **(COMMON TO ALL BRANCHES)** **Max Marks: 70**

Answer ALL questions in Module I and II

Answer ONE out of two questions in Modules III, IV and V

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

1. (a) Use the Gauss-Jordan elimination method to compute the inverse of the matrix

$$\begin{bmatrix} 1 & 0 & 4 \\ 2 & -2 & 1 \\ -1 & 1 & -1 \end{bmatrix}$$ **[7M]**

(b) For the matrix A= $\begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find the values of x and y so that A^2+xI=yA, where I is an identity matrix. Hence find A^{-1} **[7M]**

MODULE – II

2. (a) Find the eigen values and eigen vectors of the matrix A= $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ **[7M]**

(b) Diagonalise the matrix and obtain the modal matrix for A= $\begin{bmatrix} -1 & 1 & 2 \\ 0 & -2 & 1 \\ 0 & 0 & -3 \end{bmatrix}$. Hence find A^5. **[7M]**

MODULE – III

3. (a) Find the shortest distance from origin to the surface $xyz^2 = 2$. **[7M]**

(b) If $x = \sqrt{vw}, y = \sqrt{wu}, z = \sqrt{uv}$ and $u = r\sin\theta.\cos\phi, v = r\sin\theta\sin\phi, w = r\cos\theta$, calculate $\dfrac{\partial(x, y, z)}{\partial(r, \theta, \phi)}$ **[7M]**

4. (a) Find the maximum value of $x^m y^n z^p$ when $x + y + z = a$. **[7M]**

(b) Show that the Rolle's theorem is applicable for the function $f(x) = e^{-x} sinx$ in the interval $[0, \pi]$. **[7M]**

MODULE – IV

5. (a) Solve: $\left(D^2+5D-6\right)y=\sin 4x$. **[7M]**

   (b) Solve $\left(D^2+2\right)y=x^2e^{3x}+e^x\cos 2x$ **[7M]**

6. (a) Solve $\left(D^2+2D+1\right)y=e^{-x}lnx$, by variation of parameters method. **[7M]**

   (b) Solve $\left(D^2-1\right)y=\cos x$ **[7M]**

MODULE – V

7. (a) Obtain the Fourier series of $f(x)=\frac{(\pi-x)}{2}$ in the interval $(0,2\pi)$ and hence deduce $\frac{\pi}{4}=1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\cdots$ **[7M]**

   (b) Find the Fourier series of $f(x)=x^3$ in $(-\pi,\pi)$. **[7M]**

8. (a) Represent $f(x)=\sin\frac{\pi x}{L}$ in 0<x<L by a Fourier cosine series. **[7M]**

   (b) Express the function $f(x)=x-\pi$ as Fourier series in the interval $(-\pi,\pi)$. **[7M]**

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