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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I Semester End Examinations (Regular) - March 2021

Regulation: UG-20

LINEAR ALGEBRA AND CALCULUS

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

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

Module – I

1. (a) Find the rank of a matrix by reducing into echelon form of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$. **[7M]**

   (b) Find the inverse of a matrix by using Gauss-Jordan method $\begin{bmatrix} 2 & 2 & 6 \\ 2 & 6 & -6 \\ 4 & -8 & -8 \end{bmatrix}$. **[7M]**

Module – II

2. (a) Verify Cayley-Hamilton theorem for A= $\begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$. Hence find the value of $5A^3$ - $7A^2$ + 3A. **[7M]**

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

Module – III

3. (a) Show that the Rolle's theorem is applicable for the function f(x)= $\log\left(\frac{x^2+ab}{x(a+b)}\right)$ in the interval $[a, b]$, $a > 0, b > 0$. **[7M]**

   (b) Show that the Lagrange's mean value theorem is applicable for the function $f(x) = x^3 - x^2 - 5x + 3$ in the interval [0,4]. **[7M]**

4. (a) If u=xyz, v=xy+yz+zx, w=x+y+z. Find $\frac{\partial(u,v,w)}{\partial(x,y,w)}$ at (1,0,1). **[7M]**
   (b) Examine the stationary points of the function $f(x,y) = x^3 + y^3 - 3x - 12y + 20$ and also state their nature. **[7M]**

Module – IV

5. (a) Solve $(D^3 + 1)y = 5e^{2x}$. **[7M]**
   (b) Solve $(D^2 - 5D + 4)y = \sin 2x + x^3 + 3$. **[7M]**

6. (a) Solve $(D^2 - 3D + 2)y = 2cos(2x + 3) + 2e^x$. **[7M]**
   (b) Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 5y = e^{-x} \tan x$ using the of method of variation of parameters. **[7M]**

Module – V

7. (a) Obtain the Fourier series expansion of f(x) given that $f(x) = x^2$ in $-\pi < x < \pi$ and deduce the value of $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + ... = \frac{\pi^2}{6}$. **[7M]**
   (b) Obtain the Fourier series of $f(x) = \begin{cases} \pi x, & 0 \leq x \leq 1 \\ \pi(2 - x), & 1 \leq x \leq 2 \end{cases}$ **[7M]**

8. (a) Find the half range Fourier sine series for the function f(x) = cos x for 0 < x < π. **[7M]**
   (b) Express $f(x) = e^{ax}$ as a Fourier series in the interval $0 < x < 2\pi$. **[7M]**

– ∘ ∘ ◯ ∘ ∘ –