Hall Ticket No | | | | | | | | | | | Question Paper Code: AHSB02

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I Semester End Examinations (Supplementary) - January, 2019

Regulation: IARE – R18

LINEAR ALGEBRA AND CALCULUS

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) Using Gauss – Jordan method, find the inverse of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & 4 \end{bmatrix}$. **[7M]**

   (b) Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ by reducing the matrix to an echelon form. **[7M]**

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

   (b) Diagonalize the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ **[7M]**

UNIT – II

3. (a) Verify Lagrange's mean value theorem for the function $f(x) = x(x-1)(x-2)$, in $\left[0, \frac{1}{2}\right]$. **[7M]**

   (b) If $u = f(x-y, y-z, z-x)$ show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. **[7M]**

4. (a) If x=u(1-v), y=uv determine $\frac{\partial(u,v)}{\partial(x,y)}$. **[7M]**

   (b) Verify Lagrange's mean value theorem for $f(x) = x^3 - x^2 - 5x + 3$ in [0,4]. **[7M]**

UNIT – III

5. (a) Solve $\left(D^2+5D+6\right)y = e^x + x^2$. **[7M]**
   (b) Find the current I(t) in a series R-L circuit in which L=1H, R=5Ω, E=1V and I(0)=0. **[7M]**

6. (a) Solve $\left(D^2-4D+3\right)y = e^x \cos 2x$. **[7M]**
   (b) Solve $(D^2+9)y = sec3x$ by the method of variation of parameters **[7M]**

UNIT – IV

7. (a) Evaluate the triple integral $\int_0^1\int_0^z\int_{x-z}^{x+z}(x+y+z)dydxdz$. **[7M]**
   (b) Evaluate $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dxdy$ by changing to polar coordinates **[7M]**

8. (a) Evaluate the double integral $\int_0^1\int_0^{\sqrt{1+x^2}}\frac{dxdy}{1+x^2+y^2}$. **[7M]**
   (b) Evaluate $\int\int_R xy(x+y)$ where R is the region bounded by the parabolas y=x^2 and y=x. **[7M]**

UNIT – V

9. (a) Show that $\vec{F} = \left(y^2-z^2+3yz-2x\right)\vec{i} + (3xz+2xy)\vec{j} + (3xz+2xy)\vec{k}$ is both irrotational and solenoidal. **[7M]**
   (b) Determine the directional derivative of f=xy^2+yz^3 at the point (2,-1,1) in the direction of the vector $\bar{a} = \bar{i} + 2\bar{j} + 2\bar{k}$. **[7M]**

10. (a) Using Gauss divergence theorem evaluate $\int\int_s \vec{F}\grave{n}\,ds$ where $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ and S is a cube bounded by the planes x=0, x=2, y=0, y=2, z=0, z=2. **[7M]**
    (b) Verify Stokes theorem for $\vec{F} = (x^2-y^2)\vec{i} + 2xy\vec{j}$ into the rectangular region in the xy-plane bounded in the lines x=0, x=a, y=0, y=b. **[7M]**

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