

## CLASS TEST FEB- 2023 (SET -A)

PAPER CODE : BS 111

Time:  $1\frac{1}{2}$  Hrs

Subject : APPLIED MATHEMATICS- I

Max. Marks: 30

**Note: Attempt Q. No. 1 which is compulsory and any two more from remaining.**

Q.1.

- a) Find the value of  $\alpha$  for which the vectors  $X_1 = [3, 1, -4]$ ,  $X_2 = [2, 2, -3]$  and  $X_3 = [0, -4, \alpha]$  are linearly independent.

2.5 CO3

- b) Find the Eigen values of the matrix  $\begin{bmatrix} 4 & 2 \\ 3 & 3 \end{bmatrix}$ .

2.5 CO3

- c) Find the unit normal to the surface  $xy^3z^2 = 4$  at  $(-1, -1, 2)$ .

2.5 CO4

- d) Evaluate the integral  $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} dx dy dz$

2.5 CO3

Q.2. (a) Reduce the Quadratic form  $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2xz$  into canonical form.

5 CO3

(b) Investigate the value of  $a$  and  $b$  so that the equations  $2x + 3y + 5z = 9$ ,  $7x + 3y - 2z = 8$  and $2x + 3y + az = b$  have (i) No solution (ii) Unique solution (iii) an infinite number of solution. 5 CO3Q.3. (a) Find the directional derivative of the function  $\phi = x^2 - y^2 + 2z^2$  at the point  $P(1, 2, 3)$  in the direction of the line  $PQ$  where  $Q(5, 0, 4)$ .

5 CO4

(b) Evaluate by using Green theorem  $\int_C (y^2 + xy)dx + x^2 dy$ , where  $C$  is bounded by $y = x$  and  $y = x^2$ .

5 CO4

Q.4. (a) By using Cayley- Hamilton theorem, Evaluate  $A^5 - 6A^4 + 6A^3 - 11A^2 + 2A + 3$ , Where

$$A = \begin{bmatrix} 4 & 3 & 1 \\ 2 & 1 & -2 \\ 1 & 2 & 1 \end{bmatrix}$$

5 CO3

(b) Find the curvature and Torsion of  $C$ ,  $r(t) = [t, t^2, t^3]$ .

5 CO4

$$2A^5 - 12A^4 + 12A^3 - 22A^2 + 4A + 6$$

$$2A^5 - 12A^4 + 72A^3 - 87A + 28I - 22A^2 + 4A + 6I$$

$$2A^5 - 12A^4 + 50A^3 - 83A + 34I = 0$$

$$12A^3 - 72A^2 + 87A - 28I$$

$$2(A^2 \times A^3)$$

$$\begin{array}{r} 32 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{c} 66 \\ 1 \\ \hline \end{array} \quad \begin{array}{c} 1 \\ 1 \\ \hline \end{array} \quad \begin{array}{c} 1 \\ 1 \\ \hline \end{array}$$