Assignment For Academic Year 2024-25 (Beginning January 2025)

Course Code: MATH310TH

B.A. -2nd Year

Course Title: Vector Calculus (SEC-2)

ASSIGNMENT-1

Attempt any THREE of the following questions. **15 Marks**

Ques 1. Find the volume of parallelopiped with coterminal edges AB, AC and AD, where A = (3, 2, 1) B = (4, 2, 1), C = (0, 1, 4) and D = (0, 0, 7).

Ques 2. Find a unit vector coplanar with $\hat{i}+\hat{j}+2\hat{k}$, $\hat{i}+2\hat{j}+\hat{k}$ and perpendicular to $\hat{i}+\hat{j}+\hat{k}$.

Ques 3. Given $\hat{a}=2\hat{i}+3\hat{j}-3\hat{k}, \hat{b}=\hat{i}-\hat{j}-2\hat{k}, \hat{c}=-\hat{i}+2\hat{j}+2\hat{k}$. Does reciprocal system exists? If so find it.

Ques 4. A particle is moving along the curve $x = t^3+1$, $y = t^2$, $z = 2t + 5$, where t is time. Find the component of velocity and acceleration at t = 1 in the direction of $\hat{i}+\hat{j}+z\hat{k}$.

Ques 5. Find Unit vector normal to the surface $f(x_1y_1z) = x^4 - 3xyz + z^2 + 1 = 0$ at point (1,1,1).

ASSIGNMENT-2

Attempt any THREE of the following questions. **15 Marks**

Ques 1. Find the directional derivative for $f = \frac{y}{x^2+y^2}$ at (0, 1) in the direction making an angle 30^0 with positive x - axis.

Ques 2. Find the constant a, b, c so that the vector $\vec{F} = (x + xy + az)\hat{i} + (bx - 3y - 3)\hat{j} + (4x + cy + 2z)\hat{k}$ is irratational.

Ques 3. Find the expression for Gradient, Divergence and Curl for curvilinear coordinates:

Ques 4. Verify divergence theorem for $F = (x^2 - yz)\hat{i} + (y^2 - zx)\hat{j} + (z^2 - xy)\hat{k}$ taken over the rectangular parallelopiped $0 \le x \le a$, $0 \le y \le b$, $0 \le z \le c$.

Ques 5. Verify Green theorem in plane for $\int_c \left[(xy+y^2)dx + x^2dy\right]$ Where c is the closed curve of region bounded by $y = x$ and $y = x^2$.