

Assignment for Academic Year 2025-2026 (Session Beginning January 2026)

B.A. -2nd Year

Course Code: MATH310TH

Course Title: Vector Calculus (SEC-2)

ASSIGNMENT-1

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

15 Marks

- Ques 1.** Find the volume of parallelepiped 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 exist? 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 $f(x,y,z) = x^4 - 3xyz + z^2 + 1 = 0$ 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° 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 irrotational.
- 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 parallelepiped $0 \leq x \leq a$, $0 \leq y \leq b$, $0 \leq z \leq c$.
- Ques 5.** Verify Green theorem in plane for
- $$\oint_c [(xy + y^2)dx + x^2dy]$$
- Where c is the closed curve of region bounded by $y = x$ and $y = x^2$.