

The Open University of Sri Lanka
Department of Mathematics
B.Sc/B.Ed. Degree Programme
No Book Test (NBT) - 2024/2025
Applied Mathematics - Level 03
ADU3300/ADE3300– Vector Algebra
Duration: - One Hour



Date: 12.10.2024

Time: 09:00 a.m. – 10:00 a.m.

Answer All questions.

1. a) Let $\underline{a}, \underline{b}, \underline{c}$ be 3 given vectors. Prove that $(\underline{a} \times \underline{b}) \times (\underline{a} \times \underline{c}) = (\underline{a} \cdot (\underline{b} \times \underline{c}))\underline{a}$.
b) Find the volume of the parallelepiped whose edges are represented by vectors $\underline{a} = 2\underline{i} + 3\underline{j} - \underline{k}$, $\underline{b} = \underline{i} - 2\underline{j} + 4\underline{k}$, and $\underline{c} = -\underline{i} + \underline{j} + 2\underline{k}$.

2. Prove that if the diagonals of a parallelogram are equal in length, then the parallelogram is a rectangle.

3. a) Find the vector equation of the plane passing through the point $P(2, -1, 3)$ and normal to the vector $\underline{n} = \underline{i} + 2\underline{j} - 2\underline{k}$.
b) Also find the angle between the above plane and the line given by parametric equations

$$x = 1 + t,$$

$$y = 2 - t,$$

$$z = 3t.$$

4. The position vector of a particle at time t is given by:

$$\underline{r}(t) = (3t^2 - 2t)\underline{i} + (4t + 1)\underline{j} + (t^3 - t)\underline{k}.$$

Find the velocity, the acceleration, and the direction of motion of the particle at time $t = 1$.