

# Jashore University of Science and Technology

## Department of Physics

### Bachelor of Science with Honours in Physics

1st semester of 1st year

Course no.: PHY 1105

Course title: Vector Analysis

Class test no.: 01

Date: May 16, 2022

1. If  $\mathbf{A} = 3\mathbf{i} - \mathbf{j} - 4\mathbf{k}$ ,  $\mathbf{B} = -2\mathbf{i} + 4\mathbf{j} - 3\mathbf{k}$ ,  $\mathbf{C} = \mathbf{i} + 2\mathbf{j} - \mathbf{k}$  find (i)  $2\mathbf{A} - \mathbf{B} + 3\mathbf{C}$  and (ii) a unit vector parallel to  $3\mathbf{A} - 2\mathbf{B} + 4\mathbf{C}$ . [5]

2. If  $\mathbf{A} = 3\mathbf{i} - \mathbf{j} + 2\mathbf{k}$ ,  $\mathbf{B} = 2\mathbf{i} + \mathbf{j} - \mathbf{k}$ , and  $\mathbf{C} = \mathbf{i} - 2\mathbf{j} + 2\mathbf{k}$ , find the vectors: (i)  $(\mathbf{A} \times \mathbf{B}) \times \mathbf{C}$ , (ii)  $\mathbf{A} \times (\mathbf{B} \times \mathbf{C})$ . [5]

3. If  $\mathbf{A} = 5t^2\mathbf{i} + t\mathbf{j} - t^3\mathbf{k}$  and  $\mathbf{B} = \sin t\mathbf{i} - \cos t\mathbf{j}$ , find (a)  $\frac{d}{dt}(\mathbf{A} \cdot \mathbf{B})$  and (b)  $\frac{d}{dt}(\mathbf{A} \times \mathbf{B})$ . [5]

4. If  $\mathbf{A} = x^2yz\mathbf{i} - 2xz^3\mathbf{j} + xz^2\mathbf{k}$  and  $\mathbf{B} = 2z\mathbf{i} + y\mathbf{j} - x^2\mathbf{k}$ , find  $\frac{\partial^2}{\partial x \partial y}(\mathbf{A} \times \mathbf{B})$  at  $(1, 0, -2)$ . [5]