B.Sc. Part II

9th paper

Date : __/__/__ Page :

Vector calculus

$$\frac{d}{dt}(3\vec{a}) = 3\frac{d\vec{a}}{dt}$$

$$\frac{d}{dt}(\vec{a}+\vec{b}) = \frac{d\vec{a}}{dt} + \frac{d\vec{b}}{dt}$$

$$\frac{d}{dt}(6\vec{a}-3\vec{b}) = 6\frac{d\vec{a}}{dt} - 3\frac{d\vec{b}}{dt}$$

$$\frac{d}{dt}(\vec{u}\cdot\vec{v}) = \frac{d\vec{u}}{dt}\cdot\vec{v} + \vec{u}\cdot\frac{d\vec{v}}{dt}$$

$$\frac{d}{dt}(\vec{u}\times\vec{v}) = \frac{d\vec{u}}{dt}\times\vec{v} + \vec{u}\times\frac{d\vec{v}}{dt}$$

$$\frac{d}{dt}(\text{constant}) = 0$$

$$\nabla = \vec{i}\frac{\partial}{\partial x} + \vec{j}\frac{\partial}{\partial y} + \vec{k}\frac{\partial}{\partial z}$$

$$\nabla\phi = \left(\vec{i}\frac{\partial}{\partial x} + \vec{j}\frac{\partial}{\partial y} + \vec{k}\frac{\partial}{\partial z}\right)\phi$$

$$= \vec{i}\frac{\partial\phi}{\partial x} + \vec{j}\frac{\partial\phi}{\partial y} + \vec{k}\frac{\partial\phi}{\partial z}$$

$$\nabla\cdot\vec{a} = \left(\vec{i}\frac{\partial}{\partial x} + \vec{j}\frac{\partial}{\partial y} + \vec{k}\frac{\partial}{\partial z}\right)\cdot\vec{a}$$

$$= \vec{i}\cdot\frac{\partial\vec{a}}{\partial x} + \vec{j}\cdot\frac{\partial\vec{a}}{\partial y} + \vec{k}\cdot\frac{\partial\vec{a}}{\partial z}$$