



National University



of Computer & Emerging Sciences

Applied Physics (NS-1001)

Quiz # 1

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Section: BCS-B

CLO1

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Q.1: Three vectors \vec{a} , \vec{b} , and \vec{c} each have a magnitude of 50 m and lie in an xy plane. Their directions relative to the positive direction of the x axis are 30° , 195° , and 315° , respectively. What are (a) the magnitude and (b) the angle of the vector $\vec{a} - \vec{b} + \vec{c}$? Draw the vector diagram as well. (6M)

$$|\vec{a}| = |\vec{b}| = |\vec{c}| = 50 \text{ m}$$

$$\theta_a = 30^\circ, \theta_b = 195^\circ, \theta_c = 315^\circ$$

$$\vec{R} = \vec{a} - \vec{b} + \vec{c}, \quad \vec{R} = R_x \hat{i} + R_y \hat{j}$$

$$(1) \quad a_x = a \cos 30^\circ = 50 \cos 30^\circ = 43.3$$

$$a_y = a \sin 30^\circ = 50 \sin 30^\circ = 25$$

$$b_x = b \cos 195^\circ = 50 \cos 195^\circ = -48.2$$

$$(2) \quad b_y = b \sin 195^\circ = 50 \sin 195^\circ = -12.99$$

$$c_x = c \cos 315^\circ = 50 \cos 315^\circ = 35.4$$

$$(3) \quad c_y = c \sin 315^\circ = 50 \sin 315^\circ = -35.4$$

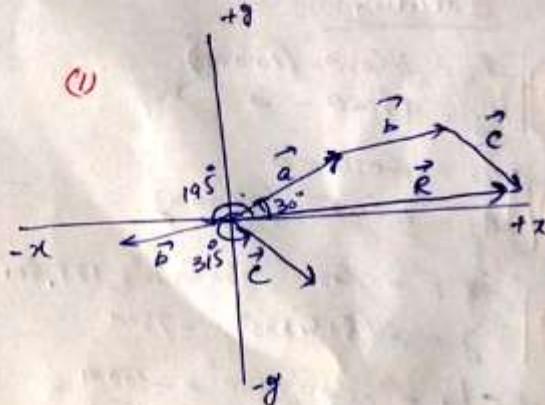
$$(4) \quad \vec{R} = \sqrt{(12.7 \text{ m})^2 + (2.6 \text{ m})^2} = 12.7 \times 10^0 \text{ m}$$

$$= \sqrt{12.7^2 + 2.6^2} = 12.7 \text{ m}$$

$$\theta_R = \tan^{-1}\left(\frac{2.6}{12.7}\right) = 1.2^\circ$$

$$(5) \quad \theta_R = 1.2^\circ$$

$$\vec{R} = 12.69 \hat{i} + 2.59 \hat{j}$$



Q.2: Find the curl of the following function (4M)

$$\vec{F} = (x^2 - y^2 + x) \hat{i} - (2xy + y) \hat{j}$$

$$\text{curl } \vec{F} = \vec{\nabla} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ x^2 - y^2 + x & -2xy - y & 0 \end{vmatrix}$$

$$\vec{\nabla} \times \vec{F} = \hat{i}(0 - 0) - \hat{j}(0 - 0) + \hat{k}(-2y + 2y)$$

$$\boxed{\vec{\nabla} \times \vec{F} = 0}$$