

IYAMU UCHENNA PRECIOUS

MECHANICAL ENGINEERING

SN 28

MAT102

19/ENG06/031

NAME: IYAMU UCHENNA PRECIOUS
DEPT: MECHANICAL ENGINEERING Sn: 28
Matic No: 19/ENG06/031 MAT102

① $A = 2i - j$ $B = 3i + j + 11k$ $C = 4i + 4j - 8k$

$$-3(2i - j) + 7(3i + j + 11k) - 8(4i + 4j - 8k)$$
$$= -6i + 3j + 21i + 7j - 92k - 32i - 32j + 64k$$
$$= -17i - 29j - 37k$$

② $K = 2A + 4B - C$

$$K = 2(2i - j) + 4(3i + j + 11k) - (4i + 4j - 8k)$$
$$K = 4i - 2j + 12i + 4j + 44k - 4i - 4j + 8k$$
$$K = 12i - 2j + 52k$$
$$|K| = \sqrt{(12)^2 + (-2)^2 + (52)^2}$$
$$|K| = \sqrt{144 + 4 + 2704}$$
$$|K| = \sqrt{2852} \quad |K| = 53.4$$

$L = \cos \alpha = \frac{12}{53.4}$ $M = \cos \beta = \frac{-2}{53.4}$ $N = \cos \gamma = \frac{52}{53.4}$

③ $(A \times B) \cdot C$

$$B \times C = \begin{vmatrix} i & j & k \\ 3 & 1 & -11 \\ 4 & 4 & -8 \end{vmatrix}$$
$$= i \begin{vmatrix} 1 & -11 \\ 4 & -8 \end{vmatrix} - j \begin{vmatrix} 3 & -11 \\ 4 & -8 \end{vmatrix} + k \begin{vmatrix} 3 & 1 \\ 4 & 4 \end{vmatrix}$$
$$= 3i - 20j + 8k$$

$$A \times B \times C = \begin{vmatrix} 1 & j & k \\ 2 & -1 & 0 \\ 3 & 1 & 8 \end{vmatrix}$$

$$= 1 \begin{vmatrix} -1 & 0 \\ 1 & 8 \end{vmatrix} - j \begin{vmatrix} 2 & 0 \\ 3 & 8 \end{vmatrix} + k \begin{vmatrix} 2 & -1 \\ 3 & 1 \end{vmatrix}$$

$$= -8i - 6j - 11k$$

$$\langle A \times B, C \rangle = \langle A \times B, B \rangle$$

$$3A - 3(2i - j) = -6i - 3j$$

$$\therefore 3A \times B = \begin{vmatrix} 1 & j & k \\ 6 & -3 & 0 \\ 3 & 1 & 11 \end{vmatrix}$$

$$= 3 \begin{vmatrix} 1 & j & k \\ 2 & 0 & 0 \\ 1 & -1 & 11 \end{vmatrix} + 11 \begin{vmatrix} 1 & j \\ 3 & 1 \end{vmatrix}$$

$$= 33i + 66j + 11k$$

$$2B \cdot C = 2(3i + j) \cdot (-11k) = 6i + 2j - 22k$$

$$\langle A \times B, C \rangle = \begin{vmatrix} 1 & j & k \\ 2 & -1 & 0 \\ 6 & 2 & -22 \end{vmatrix}$$

$$= 1 \begin{vmatrix} -1 & 0 \\ 2 & -22 \end{vmatrix} - j \begin{vmatrix} 2 & 0 \\ 6 & 22 \end{vmatrix} + k \begin{vmatrix} 2 & -1 \\ 6 & 2 \end{vmatrix}$$

$$= 22i - 66j + 10k$$

$$\langle A \times B, C \rangle = \langle A \times B, C \rangle = 22i - 66j + 10k \cdot 6i + 2j - 22k$$

$$= 200$$

① Perpendicular vectors are two vectors A & B whose dot product is zero
 Product $\vec{A} \cdot \vec{B} = 0$ while Coplanar $\Rightarrow A \times B \times C = 0$