

OLATUNJI ANUOLUWAPO TEMIJOPE MAT 102
COMPUTER ENGINEERING.

19/ENG 02 / 050.

Assignment

(I) $A = 2i - j$, $B = 3i + j - 11k$, $C = 4i + 4j - 5k$.

(i) $-3A + 7B - 8C$.

$$-3(2i - j) + 7(3i + j - 11k) - 8(4i + 4j - 5k)$$

$$-6i + 3j + 21i + 7j - 77k - 32i - 32j + 40k$$

$$(-6i + 21i - 32i) + (3j + 7j - 32j) + (-77k + 40k)$$

$$= -36i - 22j - 37k$$

(ii) $K = 2A + 4B - C$.

$$K = 2(2i - j) + 4(3i + j - 11k) - 1(4i + 4j - 5k)$$

$$= 4i - 2j + 12i + 4j - 44k - 4i - 4j + 5k$$

$$(4i + 12i - 4i) + (-2j + 4j - 4j) + (-44k + 5k)$$

$$12i - 2j - 39k$$

$$|K| = \sqrt{12^2 + (-2)^2 + (-39)^2}$$

$$= \sqrt{144 + 4 + 1521}$$

$$= \sqrt{1669}$$

$$= 40.85$$

$$C = \cos \alpha = \frac{12}{40.85}$$

$$40.85$$

$$M = \cos \beta = \frac{-2}{40.85}$$

$$N = \cos \delta = \frac{-39}{40.85}$$

(iii) $A \times (B \times C)$

$$B \times C = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 1 & -11 \\ 4 & 4 & -5 \end{vmatrix}$$

$$+i \begin{vmatrix} 1 & -11 \\ 4 & -5 \end{vmatrix} - j \begin{vmatrix} 3 & -11 \\ 4 & -5 \end{vmatrix} + k \begin{vmatrix} 3 & 1 \\ 4 & 4 \end{vmatrix}$$

$$i(-5 + 44) - j(-15 + 44) + k(12 - 4)$$

$$39i - 29j + 8k$$

$$A \times (B \times C) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -1 & 0 \\ 39 & -29 & 8 \end{vmatrix}$$

$$+i \begin{vmatrix} -1 & 0 \\ -29 & 8 \end{vmatrix} - j \begin{vmatrix} 2 & 0 \\ 39 & 8 \end{vmatrix} + k \begin{vmatrix} 2 & -1 \\ 39 & -29 \end{vmatrix}$$

$$i(-8 + 0) - j(16 - 0) + k(-58 + 39)$$

$$= -8i - 16j - 19k$$

(iv) $C(3A \times B) \cdot C(A \times 2B)$

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

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

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

$$+i \begin{vmatrix} -3 & 0 \\ 1 & -11 \end{vmatrix} - j \begin{vmatrix} 6 & 0 \\ 3 & -11 \end{vmatrix} + k \begin{vmatrix} 6 & -3 \\ 3 & 1 \end{vmatrix}$$

$$i(33 - 0) - j(-66 - 0) + k(6 + 9)$$

$$33i + 66j + 15k$$

$$\therefore (A \times 2B) = \begin{vmatrix} i & j & k \\ 2 & -1 & 0 \\ 6 & 2 & -22 \end{vmatrix}$$

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

$$i(22 - 0) - j(-44 - 0) + k(4 + 6)$$

$$22i + 44j + 10k$$

$$\therefore (3A \times B) \cdot (A \times 2B) = (33i + 66j + 15k) \cdot (22i + 44j + 10k)$$

$$= 726 + 2904 + 150$$

$$= 3780$$

$$\textcircled{v} A - 2B - C$$

$$(2i - j) - 2(3i + j - 11k) - (4i + 4j - 5k)$$

$$(2i - j) + (6i - 2j + 22k) + (-4i - 4j + 5k)$$

$$(2i + 6i - 4i) + (-j - 2j - 4j) + (22k + 5k)$$

$$= 4i - 7j + 27k.$$

② Perpendicular vectors: Two vectors a and b are said to be perpendicular if $a \cdot b = 0$.

Coplanar vectors: Three vectors A , B , and C are said to be coplanar if $A \cdot (B \times C) = 0$.