

$$1 \begin{bmatrix} -1 & 0 & 7 \\ 2 & -22 & 6 \end{bmatrix} - j \begin{bmatrix} 2 & 0 & 1 \\ 6 & -22 & 6 \end{bmatrix} + k \begin{bmatrix} 2 & 0 & -1 \\ 6 & 2 & 2 \end{bmatrix}$$

$$1 \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix} - j \begin{bmatrix} 4 & 4 \\ 4 & 4 \end{bmatrix} + k \begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$$

$$(A \times 2B) = 22i + 44j + 10k$$

$$\therefore (3A \times B) \cdot (A \times 2B)$$

$$(-33i + 66j - 1) \cdot (22i + 44j + 10k)$$

$$-726 + 2904 - 150 = 3480$$

$$v.) A = 2B - C$$

$$A = 2i - j + k - 2(3i + j - 11k) - C^2 (4i + 4j - 5k)$$

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

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

$$= -8i - 7j + 27k$$

2.) A perpendicular vector : 2 vectors A & B are said to

$$\text{be perpendicular if } A \cdot B = 0$$

* A co-planar vector : 3 vectors A, B, and C are said

$$\text{to be co-planar if vector } A \cdot (B \times C) = 0$$

$$1 \begin{vmatrix} 1 & -11 \\ 4 & -5 \end{vmatrix} + j \begin{vmatrix} 2 & -11 \\ 4 & -5 \end{vmatrix} + k \begin{vmatrix} 3 & -11 \\ 4 & 4 \end{vmatrix}$$

$$1[-5+44] + j[-15+44] + k[-12-4] = 8$$

∴ $A \times (B \times C)$

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

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

$$1[8] - 0 = 8i - [16-0] = 16j + [19] = 19k$$

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

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

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

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

$(3A \times B) =$

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

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

$$1[-33] + j[66] + k[-17]$$

$$(3A \times B) = -33i + 66j + 17k$$

∴ $(A \times 2B)$

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

MAT 102

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Matric Number: 19/ENGG04/033

Sendal Number: 04

DEPT: ELECT/ELECT ENGR.

1.) $-3A + 7B - 8C$

where $A = 2i - j$, $B = 3i + j - 11k$ and $C = 4i + 4j - 5k$

$$-3(2i + 0j) + 7(3i + j - 11k) - 8(4i + 4j - 5k)$$

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

$$(-6i + 21i - 32i) \quad 3j + 7j - 32j$$

$$-17i \quad -22j \quad -37k$$

$$= -17i - 22j - 37k$$

ii.) $k = 2A + 4B - C$, find the direction cosine of k

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

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

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

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

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

$$|k| = 40.85$$

$$\therefore \cos \alpha = \frac{12}{40.85}, \cos \beta = \frac{-2}{40.85}, \cos \gamma = \frac{-39}{40.85}$$

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

	+	-	+
	1	j	k
3	1	-11	
4	4	-5	