

QUESTION.....

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Do not write in either margin

REDIA MARRIAMS

Mechanical Engineering

M/20/201/2029

M11102

$$A = 2i - j \quad B = 3i + j - 11k \quad C = 4i + 4j - 5k$$

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

ii) If  $K = 2A + 4B - C$  find direction cosine

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

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

v)  $A \cdot 2B \cdot C$

5. Define perpendicular and co-planar vector

Soln-

i)  $-3(2i - j) + 7(3i + j - 11k) - 8(4i + 4j - 5k)$   
 $-6i + 3j + 21i + 7j - 77k - 32i + 32j - 40k$   
 $-17i + 42j - 117k$

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

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

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

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

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

$$= \sqrt{1669}$$

$$\cos \alpha = \frac{12}{\sqrt{1669}}$$

$$\cos \beta = \frac{-2}{\sqrt{1669}}$$

$$\cos \gamma = \frac{-39}{\sqrt{1669}}$$

2	+	-	+
1		j	k
2		-1	0
3		1	-11
4		4	-5

$$2 \begin{vmatrix} 1 & -11 \\ 4 & -5 \end{vmatrix} - 1 \begin{vmatrix} 3 & -11 \\ 4 & -5 \end{vmatrix} + 0 \begin{vmatrix} 3 & 1 \\ 4 & 4 \end{vmatrix}$$

$$2(39) - 1(29) + 0(8)$$

$$78 - 29 = 49$$

$$N) (3A \times B) - (A \times 2B)$$

$$(6i - 3j \times 3i + 2j - 11k) \cdot (2i - j \times 6i + 2j - 20k)$$

1		j	k
6		-3	0
3		1	-11

$$1(33 - 0) - j(-66 - 0) + k(6 - 67)$$

$$33i + 66j + 15k = (3A \times B)$$

1		j	k
2		-1	0
6		2	-22

$$1(22 - 0) - j(-44 - 0) + k(4 - (-6))$$

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

i		j	k
33		66	15
22		44	10

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$$i(660-660) - j(330-330) + k(1452-1452) \\ = 0$$

✓ #

✓  $A - 2B - C$

$$(2i - j) - (6i + 2j - 22k) - (4i + 4j - 5k) \\ 2i - j - 6i - 2j + 22k - 4i - 4j + 5k \\ -8i - 7j + 27k$$

2 perpendicular vectors are vectors whose dot product  
are equal to zero

$$\text{Eg} - A \cdot B = 0$$

Coplanar Vectors

3 Vectors A, B and C are said to be Coplanar

$$\text{if } A \cdot (B \times C) = 0$$