

SIN=97

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19/ENG 06/010

Maths 102

Mechanical Engineering

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

(D) $(A-2B) \times C$

$2B=6i-4j+2k, A=4i+j-2k$

$A-2B=4i+j-2k$

$A-2B = \frac{6i-4j+2k}{-2i+5j-4k}$

$(A-2B) \times C$

$= \begin{vmatrix} + & - & + \\ i & j & k \\ -2 & 5 & -4 \\ 1 & 0 & -2 \end{vmatrix} = i \begin{vmatrix} 5 & -4 \\ 0 & -2 \end{vmatrix} - j \begin{vmatrix} -2 & -4 \\ 1 & -2 \end{vmatrix} + k \begin{vmatrix} -2 & 5 \\ 1 & 0 \end{vmatrix}$

$= i[-10] - j[8] + k[-5]$

$= -10i - 8j - 5k \quad \text{M}$

(II) $A \times (2C \times 3B)$

$2C = 2i - 4k$

$3B = 9i - 6j + 3k$

$2C \times 3B = \begin{vmatrix} + & - & + \\ i & j & k \\ 2 & 0 & -4 \\ 9 & -6 & 3 \end{vmatrix} = i \begin{vmatrix} 0 & -4 \\ -6 & 3 \end{vmatrix} - j \begin{vmatrix} 2 & -4 \\ 9 & 3 \end{vmatrix} + k \begin{vmatrix} 2 & 0 \\ 9 & -6 \end{vmatrix}$

$= i[-24] - j[42] + k[-12]$

$2C \times 3B = -24i - 42j - 12k$

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

$= \begin{vmatrix} + & - & + \\ i & j & k \\ 4 & 1 & -2 \\ -24 & -42 & -12 \end{vmatrix}$

$= i \begin{vmatrix} 1 & -2 \\ -42 & -12 \end{vmatrix} - j \begin{vmatrix} 4 & -2 \\ -24 & -12 \end{vmatrix} + k \begin{vmatrix} 4 & 1 \\ -24 & -42 \end{vmatrix}$

$= i[-96] - j[-96] + k[-144]$

$= -96i + 96j - 144k \quad \text{M}$

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$$(2) \quad A = Pi - 6j - 3k$$

$$B = 4i + 3j - k$$

$$C = i - 3j + 2k$$

$$= \begin{vmatrix} P & -6 & -3 \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix} = 0$$

$$= P \begin{vmatrix} 3 & -1 \\ -3 & 2 \end{vmatrix} + 6 \begin{vmatrix} 4 & -1 \\ 1 & 2 \end{vmatrix} - 3 \begin{vmatrix} 4 & 3 \\ 1 & -3 \end{vmatrix} = 0$$

$$= P [3] + 6 [9] - 3 [-15] = 0$$

$$= 3P + 54 + 45 = 0$$

$$= 3P + 99 = 0$$

$$\frac{3P}{3} = \frac{-99}{3}$$

$$P = -33 \text{ MN}$$