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19/ENG06/022

MECHANICAL ENGINEERING

MATH 102

S/N: 37

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MAT 102

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$$D) \quad A = 4\hat{i} + \hat{j} - 2\hat{k} \quad C = \hat{i} - 2\hat{k}$$
$$B = 3\hat{i} - 2\hat{j} + \hat{k}$$

$$g) \quad (A - 2B) \times C$$

$$2B = 2(3\hat{i} - 2\hat{j} + \hat{k})$$
$$= 6\hat{i} - 4\hat{j} + 2\hat{k}$$

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

$$(A - 2B) \times C = \begin{vmatrix} + & - & + \\ \hat{i} & \hat{j} & \hat{k} \\ -2 & 5 & -4 \\ 1 & 0 & -2 \end{vmatrix}$$

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

$$+\hat{i}(-10 - 0) - \hat{j}(-4 - (-4)) + \hat{k}(0 - 5)$$

$$= -10\hat{i} - 5\hat{k}$$

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

$$2C = 2(\hat{i} - 2\hat{k})$$

$$= 2\hat{i} - 4\hat{k}$$

$$3B = 3(3\hat{i} - 2\hat{j} + \hat{k})$$

$$= 9\hat{i} - 6\hat{j} + 3\hat{k}$$

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

$$+\hat{i} \begin{vmatrix} 0 & -4 \\ -6 & 3 \end{vmatrix} - \hat{j} \begin{vmatrix} 2 & -4 \\ 9 & 3 \end{vmatrix} + \hat{k} \begin{vmatrix} 2 & 0 \\ 9 & -6 \end{vmatrix}$$

$$= -24\hat{i} - 42\hat{j} - 12\hat{k}$$

$$A \times (2C \times 3B) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 4 & 1 & -2 \\ -24 & -42 & -12 \end{vmatrix}$$

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

$$= \hat{i}(-12 - (84)) - \hat{j}(-48 - 48) + \hat{k}(-168 - (-24))$$

$$= -96\hat{i} + 96\hat{j} - 144\hat{k}$$

$$2.) \begin{aligned} A &= p\hat{i} - 6\hat{j} - 3\hat{k} \\ B &= 4\hat{i} + 3\hat{j} - \hat{k} \\ C &= \hat{i} - 3\hat{j} + 2\hat{k} \end{aligned}$$

$$A \cdot (B \times C) = \begin{vmatrix} + & - & + \\ p & -6 & -3 \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix}$$

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

$$\begin{aligned} &= p(6-3) + 6(8+1) - 3(-12-3) = 0 \\ &= 3p + 54 + 45 = 0 \end{aligned}$$

$$= \frac{99}{-3} = -\frac{3p}{3} +$$

$$p = -33 //$$