

NWOKORIE PASCAL CHINAMDI

MECHATRONICS ENGINEERING

19/ENG051043

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a)  $\min = 0$

$$(P \times 4) - (6 \times 3) - (3 \times -1) = 0$$

$$4P - 18 + 3 = 0$$

$$4P - 15 = 0$$

$$4P = 15$$

$$P = \frac{15}{4}$$

b)  $M \cdot (N \times O) = 0$

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

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

$$P(6 + 3) + 6(8 + 1) - 3(-12 - 3) = 0$$

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

$$3P = -54 - 45$$

$$3P = -99 = -33$$

$$P = \frac{-33}{3}$$

$$P = \underline{\underline{-33}}$$

2.  $\text{Sum} = (3i + 2i + 5i) + (2j - j + 2j) + (5k + 6k - 3k)$

$$= 10i + 3j + 8k$$

$$\vec{c} = 10i + 3j + 8k$$

$$a_x = 10, \quad a_y = 3, \quad a_z = 8$$

$$|c| = \sqrt{(10)^2 + (3)^2 + (8)^2}$$

$$= \sqrt{100 + 9 + 64}$$

$$= \sqrt{173}$$

$$|c| = \underline{\underline{13.15}}$$

$$\cos \alpha = \frac{10}{13.15} = \underline{\underline{0.7605}}$$

$$\cos \beta = \frac{3}{13.15} = \underline{\underline{0.2281}}$$

$$\cos \gamma = \frac{8}{13.15} = \underline{\underline{0.6084}}$$

$$e.c = \frac{10i + 3j + 8k}{\sqrt{175}}$$

3)

$$\int (F \times V) du$$

$$\begin{vmatrix} i & j & k \\ 3u & u^2 & u+2 \\ 2u & -3u & u-2 \end{vmatrix}$$

$$i \begin{vmatrix} u^2 & u+2 \\ -3u & u-2 \end{vmatrix} - j \begin{vmatrix} 3u & u+2 \\ 2u & u-2 \end{vmatrix} + k \begin{vmatrix} 3u & u^2 \\ 2u & -3u \end{vmatrix}$$

$$i(u^3 - 2u^2 + 3u^2 + 6u) - j(3u^2 - 6u - 2u^2 - 4u) + k(-9u^2 - 2u^3)$$

$$= (u^3 + u^2 + 6u)i + (-u^2 + 10u)j + (-9u^2 - 2u^3)k$$

$$\int_0^1 (u^3 + u^2 + 6u)i + (-u^2 + 10u)j + (-9u^2 - 2u^3)k \, du$$

$$\left[ \frac{u^4}{4} + \frac{u^3}{3} + 3u^2 \right]_0^1 i + \left[ -\frac{u^3}{3} + 5u^2 \right]_0^1 j + \left[ -3u^2 - \frac{1}{2}u^4 \right]_0^1 k + C$$

$$= \left[ \frac{1}{4} + \frac{1}{3} + 3 \right] i + \left[ -\frac{1}{3} + 5 \right] j + \left[ -3 - \frac{1}{2} \right] k + [0]k$$

$$= \frac{43}{12} i + \frac{14}{3} j - \frac{7}{2} k$$