19/ENGOS/054 MECHATRONICS ENGINEERING

OMOLUABI SEAN SEREMI

(1) $x = t^2$, $y = -5t^2 + 6$, $z = t + 7$

$\therefore P = t^2 i + (-5t^2 + t)j + (t+7)k$

$V = dP/dt = 2ti + (-10t + 1)j + 1k$

$A = dV/dt = 2i - 10j$

(2) $P = i - 9j - 4k$, $Q = 8i - 3j + 6k$, $R = i - 4j - 3k$

$$(P \times Q) = \begin{vmatrix} i & j & k \\ 1 & -9 & -4 \\ 8 & -3 & 6 \end{vmatrix} = \begin{vmatrix} -9 & -4 \\ -3 & 6 \end{vmatrix} i - \begin{vmatrix} 1 & -4 \\ 8 & 6 \end{vmatrix} j + \begin{vmatrix} 1 & -9 \\ 8 & -3 \end{vmatrix} k$$

$= (-54 - 12)i - (6 + 32)j + (-3 + 72)k$

$= -66i - 38j + 69k$

$$(R \times P) = \begin{vmatrix} i & j & k \\ 1 & -4 & -3 \\ 1 & -9 & -4 \end{vmatrix} = \begin{vmatrix} -4 & -3 \\ -9 & -4 \end{vmatrix} i - \begin{vmatrix} 1 & -3 \\ 1 & -4 \end{vmatrix} j + \begin{vmatrix} 1 & -4 \\ 1 & -9 \end{vmatrix} k$$

$= (16 - 27)i - (-4 + 3)j + (-9 + 4)k$

$= -11i + j - 5k$

$(P \times Q) \cdot (R \times P) = (-66 \times -11) + (-38 \times 1) + (69 \times -5) = 343$ //

(3) $\int F = \int 5\cos 7t\, i - \int 2e^{3t} j - \int 4t^3 k$

$= 5/7 \sin 7t\, i - 2/3 e^{3t} j - t^4 k$ //