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DEPARTMENT: COMPUTER SCIENCE

MATRIC NO: 19/SCID1/DIS

ASSIGNMENT

① $x = t^2$, $y = -5t^2 + t$ and $z = t + 7$

$$r = xi + yj + zk$$

$$r = (t^2)i + (-5t^2 + t)j + (t + 7)k$$

$$\text{Velocity} = \frac{dr}{dt} = 2ti + (-10t + 1)j + (1)k$$

$$\text{Acceleration} = \frac{d^2r}{dt^2} = 2i - 10j$$

② $P = i - 9j - 4k$

$$Q = 8i - 3j + 6k$$

$$R = i - 4j - 3k$$

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

$$\begin{aligned} (P \times Q) &= \begin{vmatrix} i & j & k \\ 1 & -9 & -4 \\ 8 & -3 & 6 \end{vmatrix} = i \begin{vmatrix} -9 & -4 \\ -3 & 6 \end{vmatrix} - j \begin{vmatrix} 1 & -4 \\ 8 & 6 \end{vmatrix} + k \begin{vmatrix} 1 & -9 \\ 8 & -3 \end{vmatrix} \\ &= i(-54 - (12)) - j(6 - (-32)) + k(-3 - (-72)) \\ &= i(-66) - j(38) + k(69) \\ &= -66i - 38j + 69k \end{aligned}$$

$$\begin{aligned} (R \times P) &= \begin{vmatrix} i & j & k \\ 1 & -4 & -3 \\ 1 & -9 & -4 \end{vmatrix} = i \begin{vmatrix} -4 & -3 \\ -9 & -4 \end{vmatrix} - j \begin{vmatrix} 1 & -3 \\ 1 & -4 \end{vmatrix} + k \begin{vmatrix} 1 & -4 \\ 1 & -9 \end{vmatrix} \\ &= i(16 - 27) - j(-4 - (-3)) + k(-9 - (-4)) \\ &= i(-11) - j(-1) + k(-5) \\ &= -11i + j - 5k \end{aligned}$$

$$\begin{aligned}
 (P \times Q) \cdot (R \times P) &= (-66i - 38j + 69k) \cdot (-11i + j - 5k) \\
 &= 726 - 38 - 345 \\
 &= \frac{343}{2}
 \end{aligned}$$

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

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

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

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

$$\int F = \frac{5i}{7} \int \cos u du - \frac{2j}{3} \int e^u du - 4k \int t^{3+1} dt$$

$$\int F = \frac{5i}{7} (\sin u) - \frac{2j}{3} (e^u) - \frac{4k}{4} \left(\frac{t^4}{4} \right)$$

$$\int F = \frac{5 \sin 7t}{7} i - \frac{2e^{3t}}{3} j - t^4 k + C$$