

ME2E HANNAH CHIBUZETE  
 18/ENG05/031  
 MECHATRONICS ENGINEERING

F12-4 ↓

$$v = (0.5t^3 - 8t) \text{ m/s}$$

$$A = \frac{dv}{dt}$$

$$\frac{dv}{dt} = 3(0.5)t^2 - 8$$

$$= 1.5t^2 - 8$$

$$A = \frac{dv}{dt} \Big|_{t=2} = 1.5(2)^2 - 8$$

$$= 6 - 8 = -2 \text{ m/s}^2$$

F12-3 ↓

$$v = (4t - 3t^2) \text{ m/s}$$

$$s = \int v dt$$

$$s = \int (4t - 3t^2) dt$$

$$= 2t^2 - t^3$$

when  $t = 4$

$$s = 2(4)^2 - (4)^3$$

$$= 32 - 64$$

$$s = -32 \text{ m}$$

F12-8 ↓

$$v = (20 - 0.5s^2) \text{ m/s}$$

$$A = \frac{dv}{ds} \cdot \frac{ds}{dt}$$

$$\frac{dv}{ds} = \frac{dv}{ds} \cdot \frac{ds}{dt}$$

$$\frac{dv}{ds} = -0.5s, \quad \frac{ds}{dt} = (20 - 0.5s^2)$$

$$A = (-0.5)(20 - 0.05s^2)$$

when  $s = 15$

$$A = (-0.5)(20 - 0.05(15)^2)$$

$$A = -13.125 \text{ m/s}^2$$

F12-7 ↓

$$A = (4t^2 - 2) \text{ m/s}^2$$

$$v = \int A dt$$

$$v = \int (4t^2 - 2) dt$$

$$= \frac{4t^3}{3} - 2t + C$$

$$s = \int v dt$$

$$= \int \left( \frac{4t^3}{3} - 2t + C \right) dt$$

$$= \frac{4t^4}{12} - \frac{2t^2}{2} + Ct$$

$$P = \frac{1}{3}t^4 - t^2 + Ct + K$$

when  $t = 0, P = 2$

$$-2 = \frac{1}{3}(0)^4 - (0)^2 + C(0) + K$$

$$K = -2$$

when  $t = 2, P = -20, K = -2$

$$-20 = \frac{1}{3}(2)^4 - 2^2 + C(2) - 2$$

$$-20 = -0.7 + 2C$$

$$C = -9.65 \quad C = -9.7$$

$$P = \frac{1}{3}t^4 - t^2 - 9.7t - 2$$

when  $t = 4$

$$P = \frac{1}{3}(4)^4 - 4^2 - (9.7 \times 4) - 2$$

$$P = 28.7 \text{ m}$$