

ENG 234

LAW-ADUE EMMANUEL

19/ENG05/069

MECHATRONICS

$$1 \quad v = (0.5t^3 - 8t) \text{ m/s}$$

$$A = \frac{dv}{dt} = 3(0.5)t^2 - 8$$
$$= 1.5t^2 - 8$$

$$A \text{ at } t=2; \quad 1.5(2^2) - 8 = 1.5(4) - 8$$
$$= 6 - 8$$

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

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

$$s = \int v dt$$

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

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

$$\text{at } t=4, \quad s = 2(4)^2 - (4)^3$$

$$= 32 - 64$$

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

$$3 \quad v = (20 - 0.5s^2) \text{ ms}^{-1}$$

$$a = \frac{\partial v}{\partial t}$$

$$\frac{\partial v}{\partial t} = \frac{\partial v}{\partial s} \cdot \frac{\partial s}{\partial t}$$

$$\equiv \frac{\partial v}{\partial s} = 0.1s, \quad \frac{\partial s}{\partial t} = (20 - 0.5s^2)$$

$$a = (-0.1s)(20 - 0.05s^2)$$

When $s = 15$;

$$a = (0.1 \times 15)(20 - (0.05 \times 15^2))$$

$$a = -13.125 \text{ ms}^{-2}$$

$$4 \quad a = (4t^2 - 2) \text{ ms}^{-2}$$

$$v = \int a dt$$

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

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

$$s = \int v dt$$

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

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

$$P = \frac{1}{3}t^4 - t^2 + ct + k$$

When $t = 0$, $P = -2$

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

When $t = 2$, $P = -20$, $k = -2$

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

$$-20 = -0.7 + 2c$$

$$c = -9.7$$

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

when $t = 4$;

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

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