

7.

$$v = (20 - 0.05s^2)$$

$$a = \frac{dv}{dt} = \frac{dv}{ds} \times \frac{ds}{dt}$$

$$= \frac{dv}{ds} \times v$$

$$\therefore a = v \frac{dv}{ds}$$

$$\frac{dv}{ds} = -0.1s$$

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

$$\text{at } s = 15\text{m}$$

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

$$a = (20 - 11.25)(-1.5)$$

$$a = (8.75)(-1.5)$$

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

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

acceleration at $s = 18\text{m}$ is $-ve$ (-13.125 m/s^2)

and shows the particle is decelerating.

18/ENGG06/009

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MECHANICAL
ENGG 239.

Assignment

1) $V = (4t - 3t^2) \text{ m/s}$ $t = 0$ $s = 0$ $t = 4$

$$V = \frac{\partial s}{\partial t} = (4t - 3t^2)$$

$$\frac{\partial s}{\partial t} = (4t - 3t^2)$$

$$\int \frac{\partial s}{\partial t} = \int_0^4 (4t - 3t^2) dt$$

$$s = \left[\frac{4t^2}{2} - \frac{3t^3}{3} \right]_0^4$$

$$s = \left[2t^2 - t^3 \right]_0^4$$

$$s = \left[2t^2 - t^3 \right]^4 - \left[2t^2 - t^3 \right]^0$$

$$s = 2(4)^2 - (4)^3 - [0]$$

$$s = 32 - 64$$

$$s = -32 \text{ m} \quad s = 32 \text{ m left of the}$$

origin

2) $V = (0.5t^3 - 8t) \text{ m/s}$ $t = 2$ $a = ?$

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

$$a = \frac{d}{dt} (0.5t^3 - 8t)$$

$$a = (1.5t^2 - 8) \text{ m/s}^2$$

$$\text{at } t = 2s$$

$$= 1.5(2)^2 - 8$$

$$= (1.5 \times 4) - 8$$

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

∴ The particle decelerate

$$3. \quad a = (4t^2 - 2)$$

$$a = \frac{dv}{dt} = (4t^2 - 2)$$

$$\frac{dv}{dt} = (4t^2 - 2)$$

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

$$v = \frac{4t^3}{3} - 2t + C_1 \text{ m/s}$$

$$v = \frac{dv}{dt} = \left(\frac{4t^3}{3} - 2t + C_1 \right) \text{ m/s}$$

$$\frac{dx}{dt} = \left(\frac{4t^3}{3} - 2t + C_1 \right)$$

$$\int dx = \int \left(\frac{4t^3}{3} - 2t + C_1 \right) dt$$

$$s = \frac{1}{3} t^4 - t^2 + C_1 t + C_2$$

$$\text{At } t = 0 \quad v = 3 = -2m$$

$$s = \frac{1}{3} t^4 - t^2 + C_1 t + C_2$$

$$-2 = \frac{1}{3} (0)^4 - (0)^2 + C_1(0) + C_2$$

$$C_2 = -2$$

$$\text{At } t = 2, \quad s = -20m$$

$$s = \frac{1}{3} t^4 - t^2 + C_1 t + C_2$$

$$-20 = \frac{1}{3} (2)^4 - (2)^2 + C_1(2) + C_2$$

$$-20 = \frac{16}{3} - 4 + 2C_1 + C_2$$

$$-20 = \frac{16}{3} + 2C_1 - 2$$

$$2C_1 = -20 + \frac{2}{3}$$

$$2C_1 = -19.33$$

$$C_1 = \frac{-19.33}{2}$$

$$C_1 = -9.67$$

$$s = \frac{1}{3} t^4 - t^2 + C_1 t + C_2$$

$$= \frac{1}{3} t^4 - t^2 - 9.67t - 2$$

$$\text{At } t = 9s \quad s = ?$$

$$s = \frac{1}{3} (9)^4 - (9)^2 - 9.67(9) - 2$$

$$s = \frac{256}{3} - 16 - 38.6668 - 2$$

$$s = 28.667m$$