

1) Onet of the Olundasyon

18 / 08 / 2023 / 049

CIVIL ENGI NEERING

ENGI NEERING MECHANICS (ENGI 234)

1) For Figure 12.3 (1)

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

$$s = \int v dt$$

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

$$= 2t^2 - \frac{2}{3}t^3$$

When $t = 4 \text{ s}$

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

$$= 32 - 64 = -32 \text{ m}$$

2) For Figure 12.4 (2)

$$v = (0.5t^2 - 8t) \text{ m/s}$$

$$A = \int v dt$$

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

$$= 1.5t^2 - 8$$

$$A = \frac{dv}{dt} \Big|_{t=2}$$

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

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

(3) For Figure 12.7 (3)

$$A = (4t^2 - 7) \text{ m/s}^2$$

$$v = \int a dt$$

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

$$s = \int v dt$$

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

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

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

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

when $t = 0$, $p = 2$

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

when $t = 2$, $p = 0$, $K = 2$

$$-20 = \frac{4}{3} (2)^3 - (2)^2 + C(2) + 2 \quad dt = \frac{ds}{v} \quad \text{and} \quad dt = \frac{dv}{a}$$

$$-20 = -0.2 + 2C$$

$$C = -9.7$$

$$p = \frac{4}{3} t^3 - t^2 - 9.7t + 2$$

when $t = 4$

$$p = \frac{4}{3} (4)^3 - (4)^2 - (9.7 \times 4) + 2$$

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

$$a = \frac{dv}{dt}, \quad \frac{dv}{dt} = \frac{dv}{ds} \cdot \frac{ds}{dt}$$

$$\frac{dv}{ds} = -0.15, \quad \frac{ds}{dt} = (20 - 0.55t^2)$$

$$A = (-0.15)(20 - 0.55t^2)$$

when $s = 15$

$$A = (-0.15 \times 15)(20 - 0.55(15)^2)$$

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

<4> For figure (11.86)

$$v = \langle 20 - 0.55t \rangle \text{ m/s}$$