

Name: Abel Chibwike David

MATRIC: 17/KMG03/002

DEPARTMENT: Civil Engineering

COURSE: KEMGINEERING MECHANICS

1) For Figure 12.3 (1)

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

$$s = \int v dt$$

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

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

When $t = 4$

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

$$= 32 - 64$$

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

2) For Figure 12.4 (3)

$$v = 10 - 5t^2 \text{ m/s}$$

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

$$\frac{dv}{dt} = 3(10 - 5t^2) - 9$$

$$= 1.5t^2 - 9$$

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

$$= 1.5(2)^2 - 9$$

$$= 6 - 9 = -3 \text{ m/s}^2$$

3) For Figure 12.7 (3)

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

$$v = \int A dt$$

$$v = \int 4t^2 dt$$

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

$$s = \int v dt$$

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

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

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

When $t = 0, P = 2$

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

$$K = -2$$

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

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

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

$$c = -9.7$$

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

When $t = 4$

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

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

4) For Figure 12.8 (4)

$$v = 20 - 0.55t^2 \text{ m/s}$$

$$dt = \frac{ds}{v} \text{ and } dt = \frac{dv}{a}$$

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

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

$$A = (-0.15)(20 - 0.055t^2)$$

When $s = 15$

$$A = (-0.1 \times 15)(20 - 0.055(15^2))$$

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