OLOGBOSERE ANTHONIA
MECHATRONICS
18/ENG05/049
ENG 234

1. $V = (4t - 3t^2)\ m/s$

$\int v.dt = s = 2t^2 - t^3 + C$

When $s = 0$ then $t = 0$

$\therefore 0 = 2(0)^2 - (0)^3 + C$

$C = 0$

$\therefore s = 2t^2 - t^3$

At $t = 4s$

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

$s = -32m$

2. $V = (0 \cdot 5t^3 - 8t)\ m/s$

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

At $t = 2s$

$a = (1.5(2)^2 - 8)\ m/s^2$

$= (6 - 8)\ m/s^2$

$a = -2\ m/s^2$

3. $a = (4t^2 - 2)\ m/s^2$

$\int a = V = \frac{4t^3}{3} - 2t + C_1$

$$\int v = s = \frac{4t^4}{12} - \frac{2t^2}{2} + c_1 t + c_2$$

$$s = \frac{t^4}{3} - t^2 + c_1 t + c_2$$

But $s = -2m$ when $t = 0s$

$$\therefore -2 = \frac{(0)^4}{3} - (0)^2 + c_1(0) + c_2$$

$$-2 = c_2$$

Then,

$$s = \frac{t^4}{3} - t^2 + c_1 t - 2$$

Also, $s = -20m$ when $t = 2s$

$$\therefore -20 = \frac{2^4}{3} - 2^2 + c_1(2) - 2$$

$$-20 = \frac{16}{3} - 4 + 2c_1 - 2$$

$$2c_1 = -20 + \frac{2}{3}$$

$$2c_1 = \frac{-58}{3}$$

$$c_1 = \frac{-29}{3}$$

Hence,

$$s = \frac{t^4}{3} - t^2 - \frac{29}{3}t - 2$$

At $t = 4s$

$$s = \frac{4^4}{3} - 4^2 - \frac{29}{3}(4) - 2$$

$$S = \frac{256}{3} - 16 - \frac{116}{3} - 2$$

$$S = \frac{86}{3}$$

$$S = 28.67m$$

4. $v = (20 - 0.05s^2)\ m/s$

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

But $a = v\left(\frac{dv}{ds}\right)$

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

At $s = 15m$

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

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

$$= 8.75(-1.5)$$

$$= -13.125\ m/s^2$$