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Chemical Engineering,
Engineering Mechanics.

F12-8 $v = (4t - 3t^2) \text{ m/s}$

to find position,

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

$$\int_0^t ds = \int_0^t (4t - 3t^2) dt$$

$$s \Big|_0^t = 2t^2 - t^3 \Big|_0^t$$

$s = 2t^2 - t^3$, when $t = 4 \text{ secs}$

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

$$s = 2(16) - 64 \therefore s = 32 - 64$$

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

F12-9 $v = (0.5t^3 - 8t) \text{ m/s}$

to find acceleration,

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

$$\therefore a = 1.5t^2 - 8 \therefore a = (1.5(2)^2 - 8)$$

$$\therefore a = (1.5 \times 4) - 8 \therefore a = 6 - 8$$

$$\therefore a = -2 \text{ m/s}^2 \text{ (deceleration)}$$

F12-9 $a = (4t^2 - 2) \text{ m/s}^2$

when $t = 0$, $s = 2 \text{ m}$; $t = 2 \text{ secs}$, $s = 20 \text{ m}$; $t = 4 \text{ secs}$,

$$a = 4t^2 - 2$$

$$\therefore v = \int a dt \therefore v = \int_0^t 4t^2 - 2 dt$$

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

$$s = \int v dt \therefore s = \int_0^t \left(\frac{4}{3}t^3 - 2t + C \right) dt$$

$$s = \frac{1}{4} \cdot \frac{4t^4}{3} - \frac{2t^2}{2} + Ct + A$$

$$s = \frac{1}{3}t^3 - t^2 + Ct + A$$

when $t = 0$, $s = 2$

$$\therefore 2 = \frac{1}{3}(0)^3 - (0)^2 + (0) + A$$

$$\therefore A = -2$$

when $t = 2$, $s = 20$

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

$$-20 = 5.33 - 4 - 2$$

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$$-20 = -0.67 + 2C$$

$$2C = -20 + 0.67$$

$$C = -19.33/2$$

The general eq

$$s = \frac{1}{3}t^3 - t^2 - 9.665t - 2$$

when $t = 4 \text{ sec}$

$$s = 85.333 - 16$$

$$\therefore s = 69.333$$

F12-8 $a = v \frac{dv}{ds}$

$$v = (20 - 0)$$

$$\frac{dv}{ds} = 0$$

$$a = (20 - 0)$$

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

$$a = (20 - 0)$$

$$\therefore (20 - 11)$$

$$= 8.5$$

$$a = -$$

Problem 12.8
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$$(2s - 1) = 18$$

$$18 = 2s - 1$$

$$19 = 2s$$

$$s = 9.5$$

$$2s = 19$$

$$19 = 2s$$

$$9.5 = s$$

$$19 = 2s$$

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$$19 = 2s$$

$$9.5 = s$$

$$s = \frac{1}{3} (t^4 - t^2 + Ct + A)$$

∴ when $t = 0, s = 2$

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

$$∴ A = -2$$

when $t = 2, s = 20$

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

$$-20 = 5.33 - 4 + 2C - 2$$

$$-20 = 5.33 - 4 - 2 + 2C$$

$$-20 = -0.67 + 2C$$

$$2C = -20 + 0.67$$

$$C = -19.33/2 ∴ C = -9.665$$

∴ The general eq.

$$s = \frac{1}{3} t^4 - t^2 - 9.665t - 2$$

when $t = 4 \text{ sec}, s = ?$

$$s = 85.333 - 16 - 38.66 - 2$$

$$∴ s = 28.673 \text{ m}$$

$$F 12.8 \quad a = v \left(\frac{dv}{ds} \right)$$

$$v = (20 - 0.05s^2) \text{ m/s}$$

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

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

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

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

$$∴ (20 - 11.25)(-1.5)$$

$$= 8.75(-1.5)$$

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

+ C dt