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18/ENG04/073

ELECTRIC
MECHANICS

1) $V = 4t - 3t^2$

$$S = \int v dt$$

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

$$S = 2t^2 - t^3 + C$$

$S = 0$ when $t = 0$

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

$$C = 0$$

$$S = 2t^2 - t^3 + C$$

$$S = 2(4)^2 - (4)^3 + C$$

$$S = 32 - 64 + 0$$

$$S = -32$$

= 32m left of the x-axis

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

$$V = \int a dt$$

$$V = \frac{4t^3}{3} - \frac{2t}{1} + C$$

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

$$= \int v dt$$

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

$$S = \frac{t^4}{3} - t^2 + \frac{C^2}{2} \quad t=2s, S=20$$

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

$$\frac{56}{3} = \frac{C^2}{2}$$

$$C^2 = \frac{112}{3} \quad C = 6.11$$

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

$$S = \frac{t^4}{3} - t^2 + \frac{56}{3} \quad t = 4s$$

$$S = \frac{4^4}{3} - 4^2 + \frac{56}{3} = \frac{256}{3} - 16 + \frac{56}{3}$$

$$\frac{256 - 48 + 56}{3}$$

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

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

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

where $t = 2s$

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

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

$$4) V = (20 - 0.05s^2) \text{ m/s}$$

$$\text{at } S = 15$$

$$V = 20 - 0.05(15)^2$$

$$V = 20 - (0.05 \times 225)$$

$$V = 20 - 11.25$$

$$V = 8.75 \text{ m/s}$$

$$\text{Using } V^2 = u^2 + 2as$$

$$8.75^2 = 0 + (2a \times 15)$$

$$30a = 76.5625$$

$$a = \frac{76.5625}{30}$$

$$a = \underline{\underline{2.55 \text{ m/s}^2}}$$