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18/ENG02/031
COMPUTER ENGINEERING
ENG 234 ASSIGNMENT

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

Recall that $V = \frac{ds}{dt}$

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

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

$$S = \left[\frac{4t^2}{2} - \frac{3t^3}{3} \right]_0^4$$
$$= [2t^2 - t^3]_0^4$$

$$S = 2(4)^2 - (4)^3 = 32 - 64 = \underline{\underline{-32m}}$$

2. $V = 0.5t^3 - 8t$

Since $A = \frac{dv}{dt}$

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

At $t = 2$

$$A = 1.5(2)^2 - 8$$
$$= 1.5(4) - 8$$
$$= \underline{\underline{-2m/s^2}} \text{ (Deceleration)}$$

$$3. v = (20 - 0.05s^2) \text{ m/s}$$

$$\text{In this case, } A = \frac{dv}{dt} = \frac{dv}{ds}$$

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

Bringing it together

$$A = \frac{dv}{ds} \times \frac{ds}{dt}$$

It can be written as

$$\frac{dv}{ds} \times v \quad \left(\frac{dv}{ds} \times \frac{ds}{dt} \right)$$

$$\therefore \frac{dv}{ds} = 0.1(15) = -1.5 \text{ m/s}$$

$$\therefore A = (20 - 0.05(15)^2) \times (-1.5)$$

$$A = (20 - 11.25) \times (-1.5) \\ = -13.125 \text{ m/s}^2$$

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

Integrating all the way back to S

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

$$v = \frac{4}{3}t^3 - 2t + C_1$$

$$S = \int 4t^3 - 2t + C_1$$

$$= \frac{4t^4}{3 \times 4} - \frac{2t^2}{2} + C_1 t + C_2$$

$$S = \frac{1}{3}t^4 - t^2 + C_1 t + C_2$$

$$\text{When } t = 0, \quad S = -2$$

$$-2 = \frac{1}{3}(0)^4 - (0)^2 + C_1(0) + C_2$$

$$\therefore C_2 = -2$$

$$\text{When } t = 2, \quad S = -20$$

$$-20 = \frac{1}{3}(2)^4 - (2)^2 + C_1(2) + (-2)$$

$$-20 = \frac{16}{3} - 4 + 2C_1 - 2$$

$$2C_1 = 2 + 4 - \frac{16}{3} - 20$$

$$2C_1 = -\frac{16}{3} - 14$$

$$C_1 = \frac{-19.33}{2}$$

$$C_1 = -9.67$$

$$C_2 = -2$$

$$C_1 = 9.67$$

So when $t = 4$

$$S = \frac{1}{3}(4)^3 - \frac{1}{2}(4)^2 - 9.67(4) - 2$$

$$= \frac{256}{3} - 16 - 38.68 - 2$$

$$S = \underline{\underline{28.653\text{m}}}$$