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MATRIC :- 19/ENG06/065
DEPARTMENT :- MECHANICAL ENGINEERING
ENG 234

1) $V = (4t - 3t^2)\ m/s$
To find the position, take the integration

$$s = \int v\,dt$$

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

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

when $t = 0$ and $s = 0$

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

$$C = 0$$

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

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

when $t = 4$

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

$$s = -32\ m$$

2) $V = (0.5t^3 - 8t)\ m/s$

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

$$a = \frac{d}{dt}(0.5t^3 - 8t)$$

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

when $t = 2$

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

$$a = 6 - 8$$

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

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

$dv = a \cdot dt$

$V = \int (4t^2 - 2)\, dt$

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

$ds = v \cdot dt$

$s = \int \left(\frac{4}{3}t^3 - 2t + C_1\right) dt$

$s = \frac{4t^4}{12} - \frac{2t^2}{2} + C_1 t_2 + C_2$

$s = \frac{1}{3}t^4 - t^2 + C_1 t_2 + C_2$

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

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

$C_2 = -2$

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

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

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

$-60 = 16 - 12 - 6 + 6C_1$

$-60 = -2 + 6C_1$

$6C_1 = -58$

$C_1 = -9.67$

when $t = 4$ to get the position

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

$= 85.3 - 16 - 38.68 - 2$

$= 28.62m$

4 $V = (20 - 0.05s^2)$ m/s

$a = \frac{v\,dv}{ds}$

$dv = -0.1s\,ds$

$a = \frac{(20 - 0.05s^2)(-0.1s)\,ds}{ds}$

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

$a = -2s + 0.005s^3$

∴ when $s = 15$ m

$a = -2(15) + 0.005(15)^3$

$a = -30 + 16.875$

$a = -13.125$ m/s^2