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18/ENG01/016
ENG
MECHANICS.

F12-3. $v = (4t - 3t^2)\ m/s$

to find position,

$v = \frac{\delta s}{\delta t} = (4t - 3t^2)$

$\int_0^s \delta s = \int_0^t (4t - 3t^2)\, \delta t$

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

$s = 2t^2 - t^3$, when $t = 4$ secs

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

$s = 2(16) - 64.$

$s = 32 - 64$

$s = 32\ m.$

F12-4. $v = (0.5t^3 - 8t)\ m/s.$

to find acceleration,

$a = \frac{\delta v}{\delta t}$

$\therefore = (3 \times 0.5)t^2 - 8$

$a = 1.5t^2 - 8.$

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

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

$a = 6 - 8$

$a = -2\ m/s^2$ (deceleration).

F12-7. $a = (4t^2 - 2)\ m/s^2$

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

" $t = 2$ secs, $s = 20m$.

$t = 4$ secs, $s = ?$

$a = 4t^2 - 2$.

$\therefore v = \int a\ dt$

$v = \int_0^t 4t^2 - 2\ dt$.

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

$s = \int v\ dt$.

$s = \int_0^t \frac{4}{3}t^3 - 2t + C\ dt$

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

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

$\therefore$ when $t = 0$, $s = 2$.

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

$\therefore A = -2$ //.

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

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

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

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

$-20 = -0.67 + 2C$.

$2C = -20 + 0.67$

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

$C = -9.665$

∴ The general equation;

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

When $t = 4$ secs, $s = ?$

$$\therefore s = \frac{1}{3}(4)^4 - (4)^2 - 9.665(4) - 2.$$

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

$$s = 28.673 \text{ m} //.$$

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

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

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

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

$s = 15$ m

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

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

$= 8.75(-1.5)$

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