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Matric No: 18(ENG03)022

① Fig 12-3

$$v = (4t - 3t^2)$$

$$\frac{dv}{dt} = 4 - 6t$$

When $t = 4$

$$\frac{dv}{dt} = 4 - 6(4)$$

$$\frac{dv}{dt} = 4 - 24$$

$$\frac{dv}{dt} = -20 \text{ m/s}^2$$

Hence $dv/dt = \text{deceleration}$

$$\bar{a} = -20 \text{ m/s}^2$$

Using $v^2 = u^2 + 2as$

but $a = \frac{v-u}{t}$

$$20 = \frac{v-0}{4}$$

$$v = 80$$

$$v^2 = u^2 + 2as$$

$$(80)^2 = (0)^2 + 2(20)s$$

$$\frac{6400}{40} = \frac{40s}{40}$$

$$s = 160 \text{ m}$$

② Fig 12-4

$$v = (0.5t^3 - 8t)$$

When $t = 2 \text{ sec}$

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

$$v = (0.5t^3 - 8t)$$

$$\frac{dv}{dt} = 1.5t^2 - 8$$

when $t = 2$

$$\frac{dv}{dt} = 15(2)^2 - 8$$

$$\frac{dv}{dt} = 6.8$$

$$\frac{dv}{dt} = -2 \text{ m/s}^2$$

It is decelerating at -2 m/s^2

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

From $a = \frac{v-u}{t}$

$$2 = \frac{v-0}{2}$$

$$v = 4 \text{ m/s}$$

$$v^2 = u^2 + 2as$$

$$(4)^2 = (0)^2 + 2(2)s$$

$$\frac{16}{4} = \frac{4s}{4}$$

$$s = 4 \text{ m}$$

③ F12-7

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

$$\frac{dv}{dt} = 8t$$

$$dv = 8t dt$$

$$\int dv = \int 8t dt$$

$$v = \frac{8t^2}{2} + C$$

$$v = 4t^2 + C$$

when $t = 0$, $C = 2 \text{ m}$

$$v = 4(0)^2 + 2$$

$$v = 2 \text{ m/s at } 2 \text{ m}$$

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

$v=36m/s$ at $20m$

$$a = \frac{v-u}{t} = \frac{36-2}{4}$$
$$= \frac{34}{4} = 8.5m/s^2$$

from $v^2 = u^2 + 2as$

$$36^2 = (2)^2 + 2(8.5)s$$

$$1296 = 4 + 17s$$

$$1296 = 21s$$

$$\frac{1296}{21} = s$$

$$s = 61.714m$$

① H. 8

$$v = (20 - 0.05s^2)$$

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

$$\frac{1}{v} = \frac{dv}{ds} \quad \text{--- (1)}$$

$$\frac{dv}{ds} = 0 - (0.1) s$$

where $s = 15m$

$$\frac{dv}{ds} = -0.1(15)$$

$$\frac{dv}{ds} = -1.5 \quad \text{--- (2)}$$

from eqn (1)

$$\frac{1}{v} = \frac{dv}{ds}$$

$$\therefore \frac{1}{v} = -1.5, \quad v = \frac{1}{-1.5}$$

$$v = -0.67m/s$$

From $v^2 = u^2 + 2as$

$$(0.67)^2 = (0)^2 + 2a(15)$$

$$0.4489 = 30a$$

$$a = \frac{0.4489}{30}$$

$$a = 0.015m/s^2$$