

F12-3

$$\textcircled{1} v = (4t - 3t^2)$$

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

When  $t = 4$ .

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

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

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

Hence,  $\frac{dv}{dt}$  is deceleration.

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

To get the distance at time, 4 sec.

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

To get velocity,  $v$ .

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

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

$$80 = v$$

$$v = 80 \text{ m/s}$$

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

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

$$6400 = 40s$$

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

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

Q12-4

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

when  $t = 2s$ .

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

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

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

when  $t = 2s$

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

$$\frac{dv}{dt} = 6 - 8$$

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

∴ It is decelerating at  $-2 \text{ m/s}^2$ .

$$\boxed{F12-7}$$

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

$$dv = 8t \cdot dt$$

dt

$$dv = 8t dt$$

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

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

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

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

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

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

when  $t = 2 \text{ s}$ ,  $c = 20 \text{ m}$ .

$$v = 4(2)^2 + 20$$

$$v = 36 \text{ m/s at } 20 \text{ m}$$

$$a = \frac{v - u}{t} = \frac{36 - 2}{4}$$

$$a = \frac{34}{4} = 8.5 \text{ m/s}^2$$

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

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

$$1296 = 4 + 17s$$

$$1296 = 21s$$

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

$$s = 61.714 \text{ m}$$

$$|1-12-8|$$

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

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

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

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

where  $s = 15\text{m}$

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

$\frac{dv}{ds}$

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

$\frac{dv}{ds}$

from eqn (i)

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

$$\frac{1}{v} = -1.5$$

$$v = \frac{1}{-1.5}$$

$$v = 0.67\text{m/s}$$

Getting the acceleration,

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

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

$$0.4489 = 30a$$

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

30

$$a = \underline{\underline{0.015\text{m/s}^2}}$$