

F12-8

$$v = (20 - 0.058^2)$$

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

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

$$\frac{dv}{ds} = 0.01s$$

where $s = 15 \text{ m}$

$$\frac{dv}{ds} = 0.01(15)$$

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

from eqn (1)

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

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

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

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

Getting the acceleration using $v^2 = u^2 + 2as$

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

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

$$0.4489 = 30a$$

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

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

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

$$\text{when } t = 2$$

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

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

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

$$\text{when } t = 2 \text{ secs}$$

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

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

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

\therefore Deceleration is -2 m/s^2

F12-7

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

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

$$dv = 8t dt$$

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

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

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

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

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

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

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

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

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

$$a = \frac{v-u}{t} = \frac{36-2}{4} = 8.5$$

$$8.5 \text{ m/s}^2$$

$$\text{from } v^2 = u^2 + 2as$$

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

$$1296 = 4 + 17s$$

$$1296 = 17s$$

$$s = \frac{1296}{17}$$

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

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Assignment

$$1) V = (4t - 3t^2) \quad [P12-3]$$

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

When $t = 4$

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

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

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

To get the distance at time, 4 secs

$$\text{Using } v^2 = u^2 + 2as$$

To get velocity v

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

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

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

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

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

$$6400 = 40s$$

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

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