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 matric: 18/ENIG02/008  
 Dept: Computer Engineering  
 Course: Engineering mechanics (ENIG 234)

① Given that

$$S = 0.5t^3 \text{ m}$$

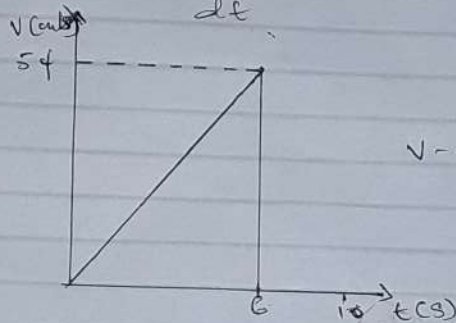
$$\frac{dS}{dt}, v = 1.5t^2$$

So at  $t = 6$

$$v = 1.5(6)^2 = 54 \text{ m/s}$$

$$S_2 = 108 \text{ m}$$

$$v = \frac{dS}{dt} = 0, v = 0 \text{ m/s}$$



v-t graph

② Given that

$$v = -4t + 80$$

$$s = \int v dt$$

$$s = \int_0^{20} -4t + 80 dt$$

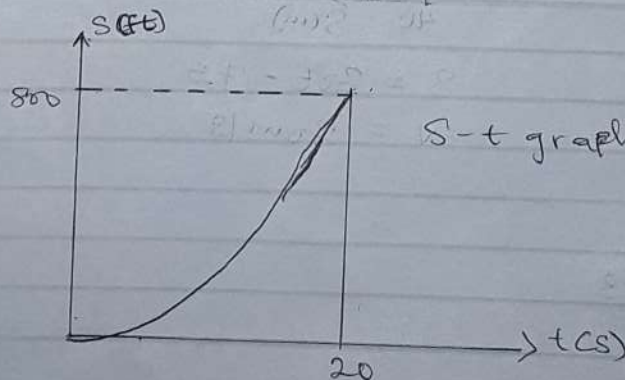
$$s = [-2t^2 + 80t] \Big|_0^{20}$$

∴ at  $t = 20$

$$s = [-2(20)^2 + 80(20)]$$

$$s = -800 + 1600$$

$$= 800 \text{ ft.}$$

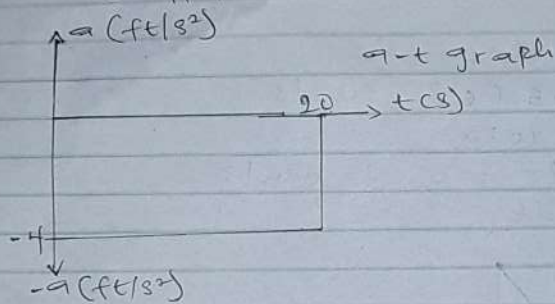


s-t graph

$$v = (-4t + 80) \text{ ft/s}$$

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

$$a = -4 \text{ ft/s}^2$$



$$(3) \quad v = (0.25s) \text{ m/s}$$

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

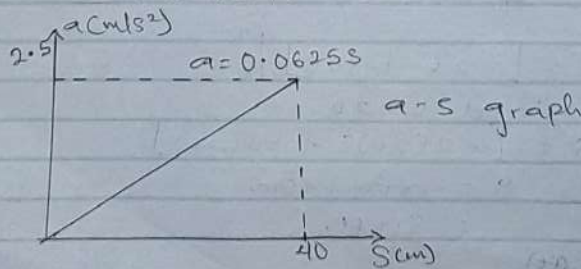
$$a = 0.25s (0.25)$$

$$a = (0.0625s) \text{ m/s}^2$$

$$\text{At } s = 40 \text{ m}$$

$$a = (0.0625 \times 40)$$

$$a = 2.5 \text{ m/s}^2$$



$$(4) \quad s = 3t^2$$

$$v = 6t$$

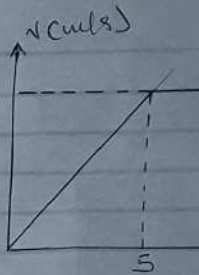
$$\text{At } t = 5$$

$$v = 6 \times 5$$

$$v = 30 \text{ m/s}$$

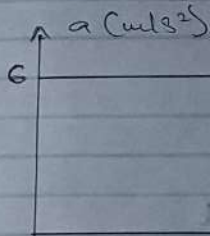
$$s = 30t - 75$$

$$v = 30 \text{ m/s}$$



$$v = (6t) \text{ m/s}$$

$$a = 6 \text{ m/s}^2$$



$$(5) \quad a = 20 \text{ m/s}^2$$

$$\int a dv = \int a ds$$

$$\int_0^v 20 dv = \int_0^s 20 ds$$

$$v = 20s$$

$$\text{At } t = 100$$

$$v = 20 \times 100$$

$$\int_0^v dv = \int_0^s ds$$

$$v - 100 = 20s - 100$$

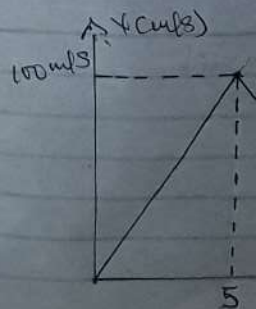
$$v - 100 = 20s - 100$$

$$v = 20s$$

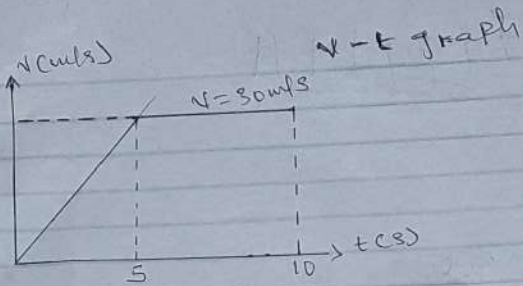
$$\text{At } v = 150$$

$$150 = 20s$$

$$s = 7.5$$

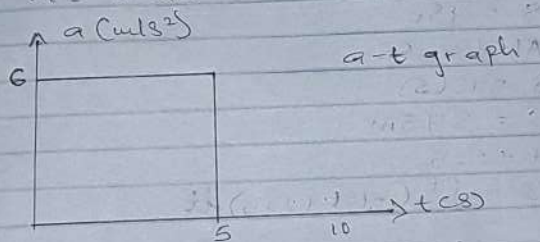






$$v = (6t) \text{ m/s} \quad v = 30 \text{ m/s}$$

$$a = 6 \text{ m/s}^2 \quad a = 0 \text{ m/s}^2$$



⑤  $a = 20 \text{ m/s}^2 \quad a = -10 \text{ m/s}^2$

$$\int_0^v dv = \int_0^t a \cdot dt$$

$$\int_0^v dv = \int_0^5 20 \cdot dt$$

$$v = 20t$$

At  $t = 5$

$$v = 100 \text{ m/s}$$

$$\int_{100}^v dv = \int_5^t -10 \cdot dt$$

$$v - 100 = -10(t - 5)$$

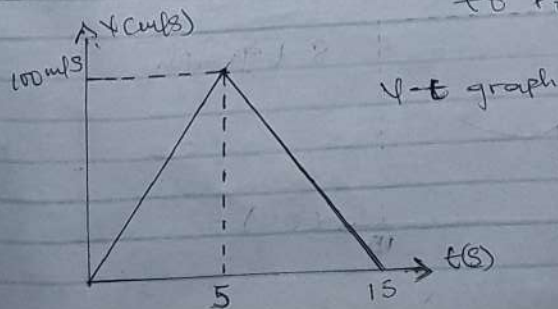
$$v - 100 = -10t + 50$$

$$v = (-10t + 150) \text{ m/s}$$

At  $v = 0$

$$-150 = -10t$$

$$t = 15 \text{ sec (time for the car to come to rest)}$$





Hyperproject

$v = 30t$

$\int ds = \int v dt$

$\int_0^s ds = \int_0^t (30t) dt$

$s = 15t^2$

At  $t = 5s$

$s = 15(5)^2$

$s = 375m$

$v = -15t + 225$

$\int_{375}^s ds = \int_5^t (-15t + 225) dt$

$s - 375 = \left[ \frac{-15t^2}{2} + 225t \right]_5^t$

$s - 375 = \left[ \frac{-15t^2}{2} + 225t \right] - \left[ \frac{-15(5)^2}{2} - 225(5) \right]$

~~$s = \frac{-15t^2}{2} + 225t - 737.5 + 375$~~

$s = \frac{-15t^2}{2} + 225t - 562.5$

$s = \frac{-15(15)^2}{2} + 225(15) - 562.5$

$s = 1125m$  (Total distance covered)

