

Mohammed Abdulmalik

18/ENG06/043

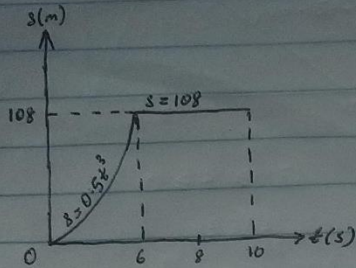
Mechanical Engineering

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18/ENG061043

Mechanical engineering

1)



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

$$v = 1.5t^2$$

$$\text{at } t = 6s$$

$$v = 1.5 \times 6^2$$

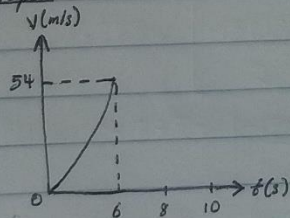
$$= 1.5 \times 36$$

$$v = 54 \text{ m/s}$$

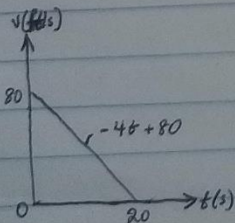
$$\text{from } t = 6s - 10s, s = 108$$

$$\therefore v = 0$$

v-t graph



2)



(i)

$$s = \int v dt$$

$$s = \int (-4t + 80) dt$$

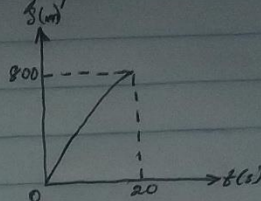
$$s = -2t^2 + 80t$$

$$\text{at } t = 20s$$

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

$$s = 1600 - 800 = 800m$$

s-t graph



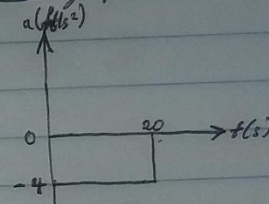
(ii) acceleration

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

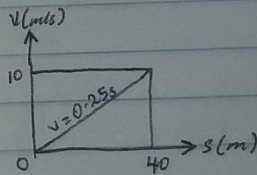
$$\therefore a = -4 \text{ m/s}^2$$

$$\text{at } t = 20s, a = -4 \text{ m/s}^2$$

a-t graph



3)



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

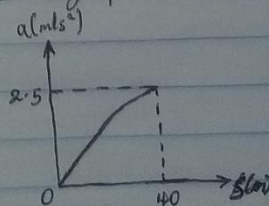
$$v = 0.25s$$

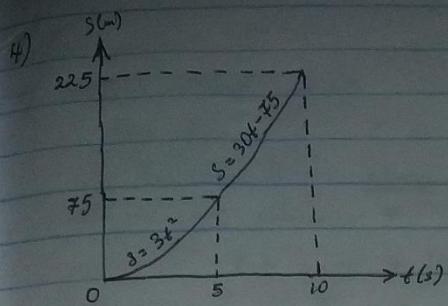
$$a = 10 \times \frac{d(0.25s)}{ds}$$

$$a = 10 \times 0.25$$

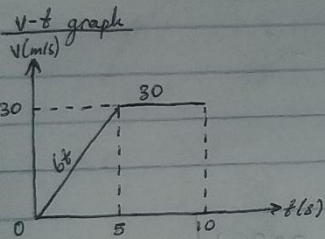
$$a = 2.5 \text{ m/s}^2$$

a-s graph

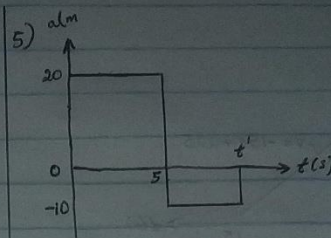
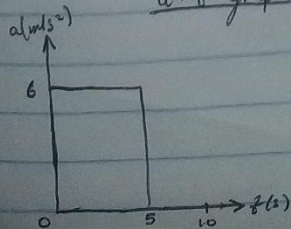
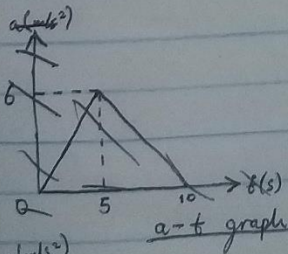




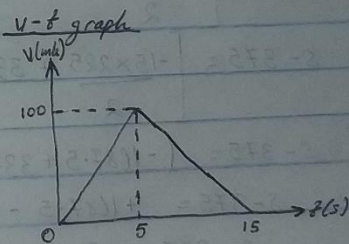
(i)  $v = \frac{ds}{dt}$   
 at  $t = 5s$   
 $v = 6t = 6 \times 5$   
 $= 30 \text{ m/s}$   
 at  $t = 10s$   
 $v = 30 \text{ m/s}$



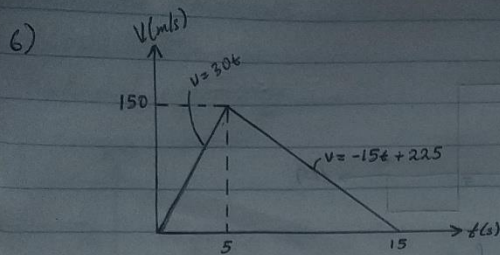
(ii)  $a = \frac{dv}{dt}$   
 at  $t = 5s$   
 $a = 6 \text{ m/s}^2$   
 at  $t = 10s$   
 $a = 0 \text{ m/s}^2$



(i)  $v = \int a dt$   
 $v = \int 20 dt$   
 $v = 20t$   
 at  $t = 5s$   
 $v = 20 \times 5 = 100 \text{ m/s}$   
 $5s < t \leq 10s$   
 $\int_{100}^v dv = \int_5^{t'} -10 dt$   
 $v - 100 = -10t' + 50$   
 $v - 100 = -10t' + 50$   
 at  $t', v = 0$   
 $0 - 100 = -10t' + 50$   
 $10t' = 150$   
 $t' = 15s$







$$0 \leq t \leq 5_s$$

$$v = 30t$$

$$\int_0^5 ds = \int_0^5 30t dt$$

$$s = 15t^2 \Big|_0^5$$

$$s = 15(5)^2 - 15(0)^2$$

$$s = 15 \times 25$$

$$s = 375_m$$

$$5_s \leq t \leq 15_s$$

$$v = -15t + 225$$

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

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

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

$$s - 375 = \left[ \frac{-15 \times 225}{2} + 3375 \right] - \left[ \frac{-15 \times 25}{2} + 1125 \right]$$

$$s - 375 = (-1687.5 + 3375) - (-187.5 + 1125)$$

$$s - 375 = +1687.5 - 937.5$$

$$s - 375 = 750$$

$$s = 1125_m$$

s-t graph

