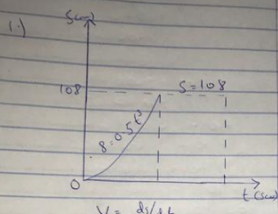


Civil Engineering



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

$$V = 1.5t^2$$

at $t = 6s$

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

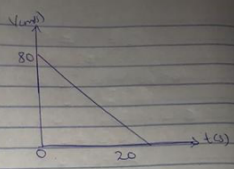
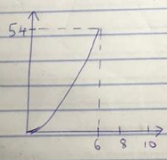
$$= 1.5 \times 36 = 54 \text{ m/s}$$

From $t = 6s - 10s$

$$s = 108$$

$$\therefore V = 0$$

V-t graph



i) $S = \int V dt$

$$S = \int (-4t + 80)$$

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

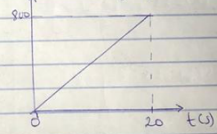
$$S = 80t - 2t^2$$

at $t = 20s$

$$S = 80(20) - 2(20)^2$$

$$S = 1600 - 800 = 800 \text{ m}$$

S-d graph

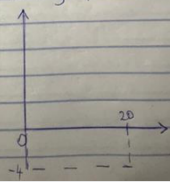


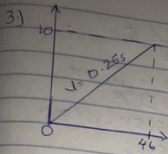
ii) $A = \frac{dv}{dt}$

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

at $t = 20$

A-t graph





$$a = (dv/dt) v$$

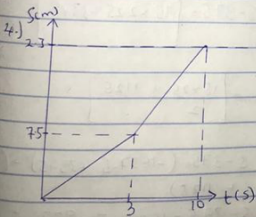
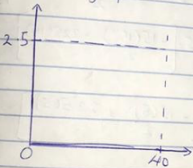
$$v = 0.25s$$

$$a = (0.25 \times d(0.25s)/ds)$$

$$a = 10 \times 0.25$$

$$a = 2.5 \text{ ms}^{-2}$$

a-s graph



$$v = ds/dt$$

$$\text{at } t = 5s$$

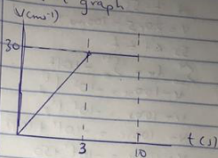
$$v = 6t = 6 \times 5$$

$$= 30 \text{ ms}^{-1}$$

$$\text{at } t = 10s$$

$$v = 30 \text{ ms}^{-1}$$

v-t graph

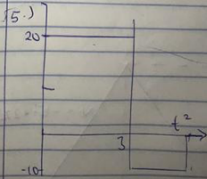
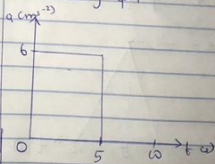


$$ii) a = dv/dt$$

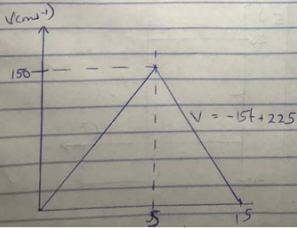
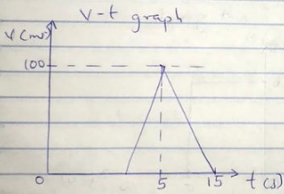
$$\text{at } t = 5, a = 6 \text{ ms}^{-2}$$

$$\text{at } t = 10, a = 0 \text{ ms}^{-2}$$

a-t graph



$$\begin{aligned}
 v &= \int 20 dt \\
 v &= 20t \\
 \text{at } t &= 5s \\
 v &= 20 \times 5 = 100 \text{ m/s} \\
 5s &\leq t \leq 15s \\
 \int_{100}^v dv &= \int_0^{t'} -10 dt \\
 v - 100 &= -10t' \quad | \times (-1) \\
 v &= 100 - 10t' \\
 v &= 100 - 10t' = -10t' + 100 \\
 v &= 100 - 10t' = -10t' + 100 \\
 \text{at } t', v &= 0 \\
 0 - 100 &= -10t' + 100 \\
 10t' &= 150 \\
 t' &= 15s
 \end{aligned}$$



$$\begin{aligned}
 0 &\leq t \leq 5 \\
 v &= 30t \\
 \int_0^s ds &= \int_0^5 30t \\
 s &= 15t^2/2 \\
 s &= 15(5)^2 - 15(0)^2 \\
 s &= 15 \times 25 \\
 s &= 375 \text{ m} \\
 5 &\leq t \leq 15s \\
 v &= -15t + 225
 \end{aligned}$$

$$\begin{aligned}
 \int_{375}^s ds &= \int_5^{15} (-15t + 225) dt \\
 s - 375 &= \left. \frac{-15t^2}{2} + 225t \right|_5^{15} \\
 s - 375 &= \left[\frac{-15(15)^2}{2} + 225(15) \right] - \left[\frac{-15(5)^2}{2} + 225(5) \right]
 \end{aligned}$$

$$\begin{aligned}
 s - 375 &= \left[\frac{-15(15)^2}{2} + 225(15) \right] - \left[\frac{-15(5)^2}{2} + 225(5) \right] \\
 s - 375 &= \left[15 \times 225 + 3375 \right] - \left[15 \times 25 + 1125 \right]
 \end{aligned}$$

$$\begin{aligned}
 s - 375 &= (-1687.5 + 3375) - (-187.5 + 1125) \\
 s - 375 &= 1687.5 - 937.5 \\
 s - 375 &= 750 \\
 s &= \underline{\underline{1125 \text{ m}}}
 \end{aligned}$$