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MECHANICAL ENGINEERING
18 / ENG 06 / 064
ENG 234: ERRATIC MOTION

Fig 12-12:

$$0 \leq t < 5; s = 3t^2$$

$$v = ds/dt = (6t) \text{ ft/s}$$

v-t graph

$$s = (30t - 75)$$

$$v = \frac{ds}{dt} = 30 \text{ ft/s}$$

$$v = \frac{\Delta s}{\Delta t} = \frac{225 - 75}{(5s) - (5s)}$$

$$v = \frac{150}{5} = 30 \text{ ft/s}$$

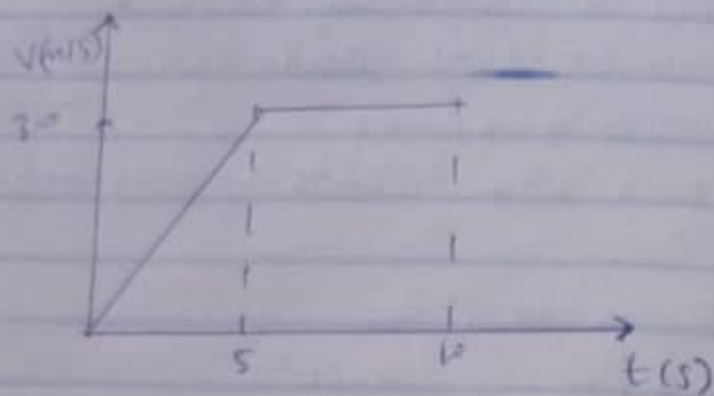
a-t graph:

$$0 \leq t < 5$$

$$v = (6t) \text{ ft/s} \quad a = dv/dt = 6 \text{ ft/s}^2$$

$$5 \leq t < 10$$

$$v = 30 \text{ ft/s} \quad a = \frac{dv}{dt} = 0$$



12 - 13

Construct $v-t$ graph

$$0 \leq t \leq t'$$

t' = time taken by car

$v-t$ graph

$$v \geq 0$$

$$t \geq 0$$

$$0 \leq t < 5; \quad a = 20 \text{ ms}^{-2}$$

$$\int_0^t 20 dt \quad v = 20t$$

$$\text{when } t = 5\text{s}, \quad v = 20(5) = 100 \text{ ms}^{-1}$$

$$5\text{s} < t \leq t'; \quad a = 10 \text{ ms}^{-2}$$

$$\int_{100 \text{ ms}^{-1}}^v dv = \int_5^t -10 dt$$

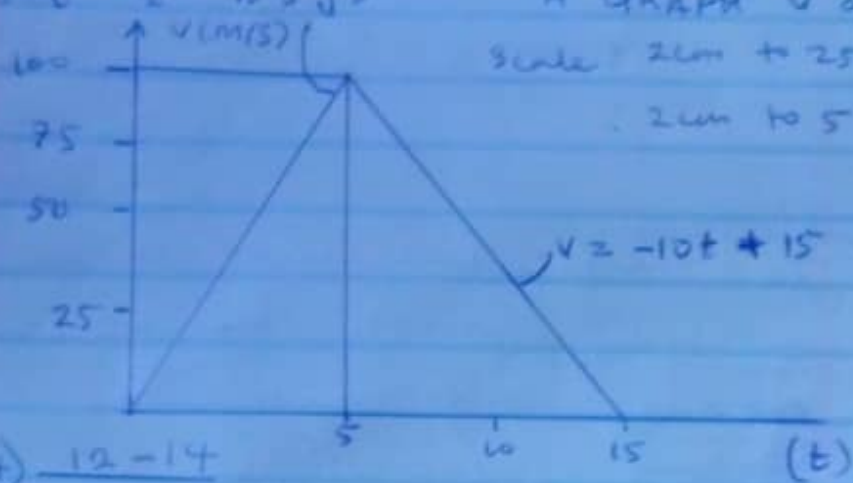
$$v = (-10t' + 150)$$

$$v = 0$$

$$0 = 10t' + 150$$

$$10t = 150$$

$$t = 15 \text{ s } v = 20t$$



$$4) \frac{12-14}{5} \quad (t)$$

$$0 \leq t \leq 5 \text{ s};$$

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

$$\int_0^5 ds = \int_0^t 20t dt$$

$$s = (10t^2) \text{ m}$$

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

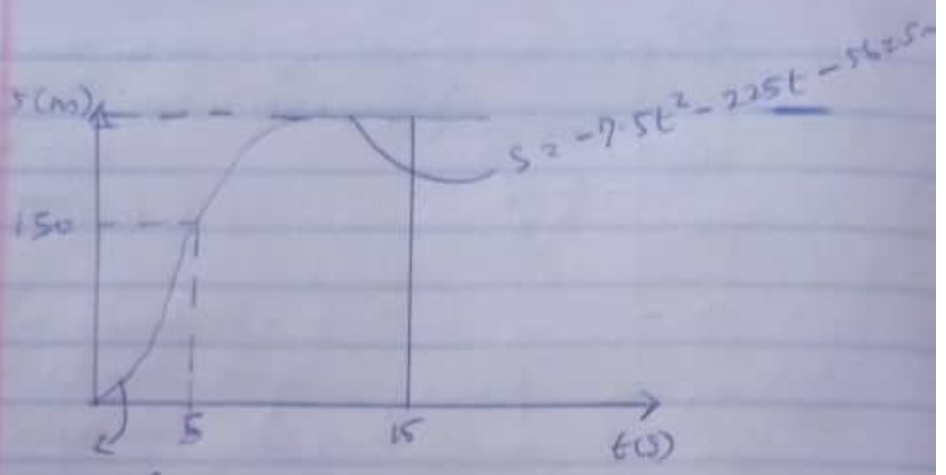
$$s = 10(5)^2 = 250 \text{ m}$$

$$5 \text{ s} \leq t \leq 15 \text{ s} \quad ds = \int (-10) dt =$$

$$\int_0^3 250 \text{ m}, \quad s - 250 = -10t$$

$$s = -10t + 250$$

$$s = -10(15) + 250 = 100 \text{ m}$$



$$s = 5t^2$$

$$0 \leq t \leq 5 \text{ s}$$

$$v = 30t$$

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

$$s = (15t^2) \text{ m}$$

$$\text{when } t = 5 \text{ s, } s = 15(5)^2 = 375 \text{ m}$$

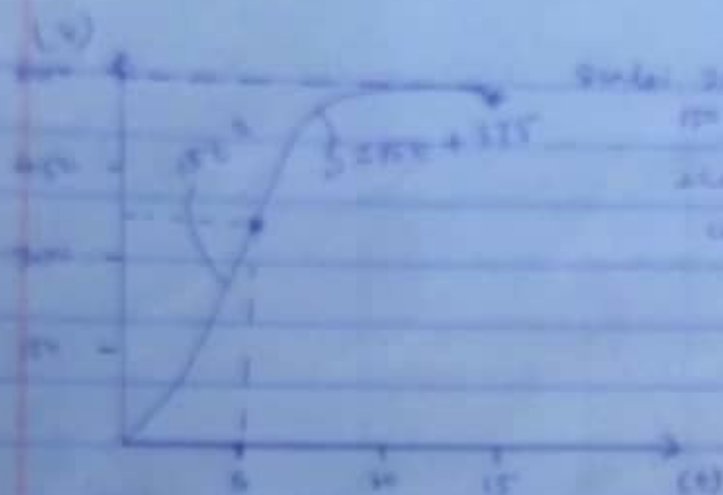
$$5 \text{ s} \leq t \leq 15 \text{ s}$$

$$v = (-15t + 225) \text{ m/s}$$

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

$$s = (-7.5t^2 + 225t - 562.5)$$

$$s = 1125 \text{ m}$$



GRAPH (12-14)

① 12-14

Time

$$v = ds/dt \quad v = \frac{ds}{dt} = 1.5t^2$$

$$0 \leq t < 6t, \quad s = 0.5t^3$$

$$\therefore v = ds/dt = 1.5t^2 \text{ ms}^{-1}$$

$$6 \leq t \leq 10, \quad s = 10t$$

$$v = ds/dt = 10$$

$$v = 1.5(6)^2 = \underline{\underline{54 \text{ ms}^{-1}}}$$