

OLOGBOSERE ANTHONIA EFE

MECHATRONICS

18/ENGO5/049

ENG 234

ASSIGNMENT 2

F12-9

For  $s = (0.5t^3)m$

For  $s = (108)m$

$$v = \frac{ds}{dt} = (1.5t^2)m/s$$

$$v = 0 m/s$$

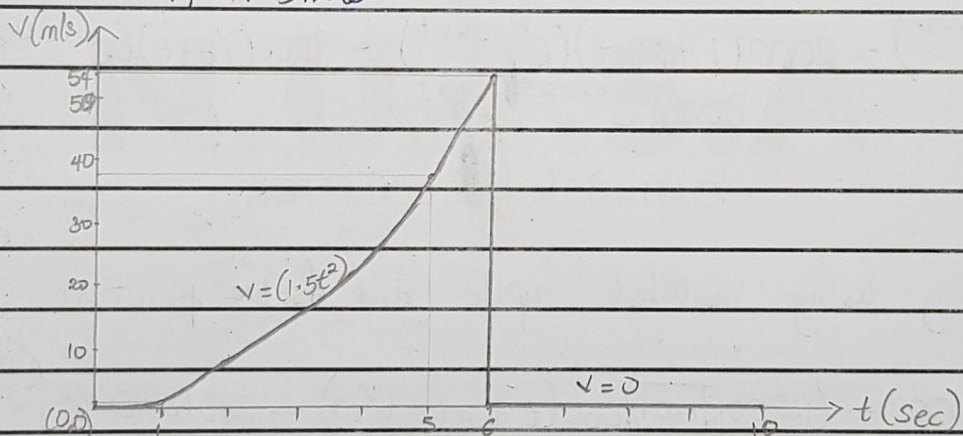
at  $t = 6$

$$v_6 = 54 m/s$$

$$v_5 = 37.5 m/s$$

$$v_0 = 0 m/s$$

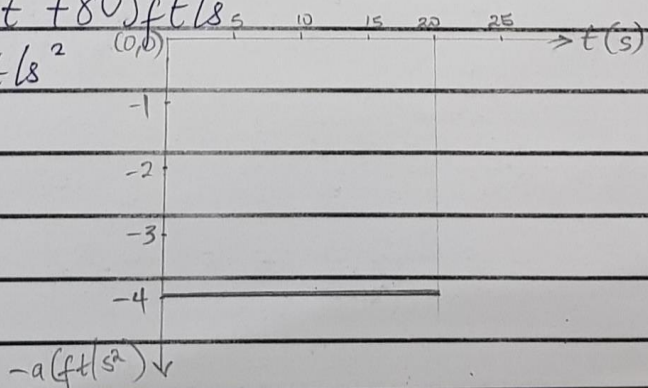
$$v_1 = 1.5 m/s$$



F12-10

For  $v = (-4t + 80)ft/s$

$$a = \frac{dv}{dt} = (-4)ft/s^2$$



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

$$\int ds = \int v \cdot dt$$

$$\therefore s = (-2t^2 + 80t) \text{ ft}$$

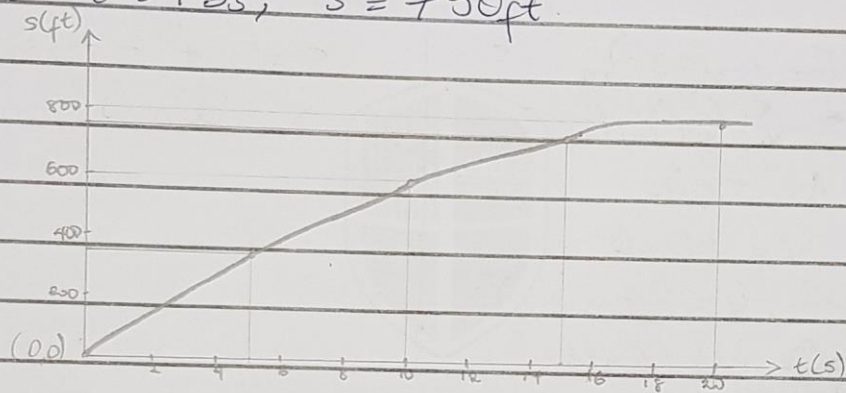
$$\text{At } t = 20 \text{ s}$$

$$s = -2(20)^2 + 80(20) \\ = 800 \text{ ft}$$

$$\text{At } t = 10 \text{ s}, s = 600 \text{ ft}$$

$$\text{At } t = 5 \text{ s}, s = 350 \text{ ft}$$

$$\text{At } t = 15 \text{ s}, s = 750 \text{ ft}$$



F12-11

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

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

$$a = 0.25s(0.25)$$

$$a = \cancel{(0.25s^2)} \text{ m/s}^2 \quad a = (0.0625s) \text{ m/s}^2$$

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

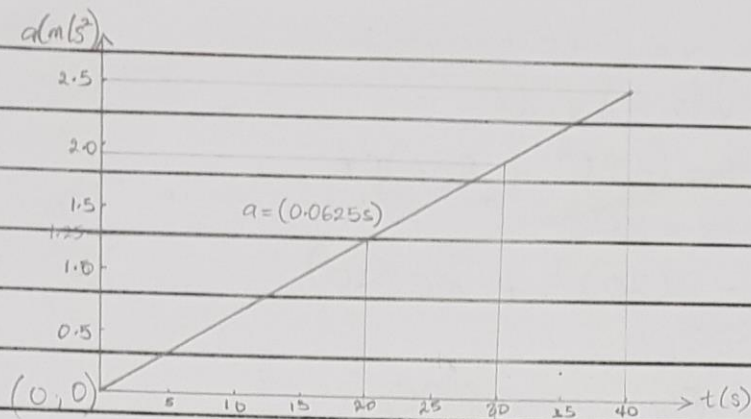
$$a = 0.0625 \times 40 = 2.5 \text{ m/s}^2$$

$$\text{At } s = 30 \text{ m}$$

$$a = 1.875 \text{ m/s}^2$$

$$\text{At } s = 20 \text{ m}$$

$$a = 1.25 \text{ m/s}^2$$



F12-12 For  $s = (3t^2)m$   
 $v = (6t)m/s$

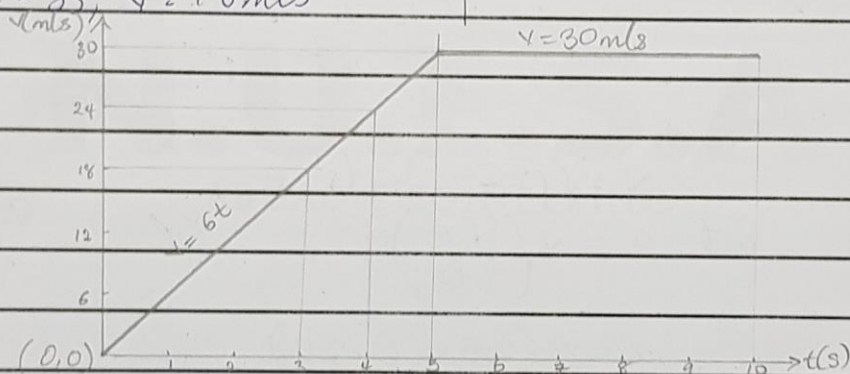
At  $t = 5s$

$v = 30m/s$

At  $t = 4s, v = 24m/s$

At  $t = 3s, v = 18m/s$

$s = (30t - 75)m$   
 $v = 30m/s$

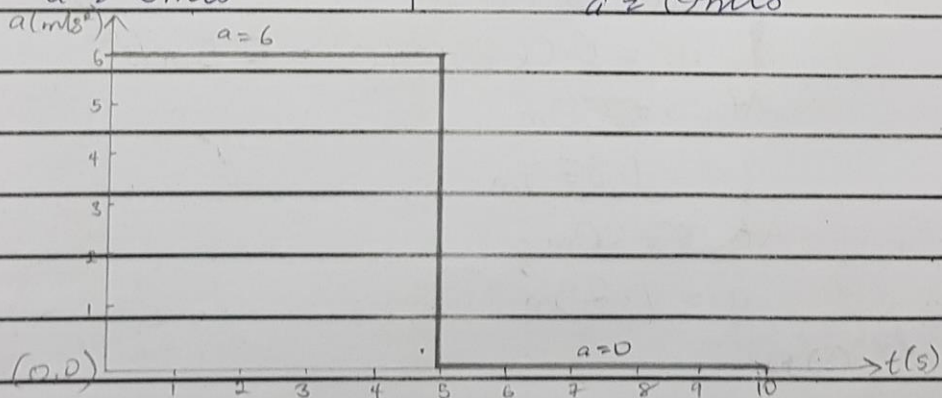


For  $v = (6t)m/s$

$a = 6m/s^2$

For  $v = 30m/s$

$a = 0m/s^2$



F12-13 For  $a = 20 \text{ m/s}^2$

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

$$v = 20t$$

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

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

$$\text{At } t = 4s, v = 80 \text{ m/s}$$

$$\text{At } t = 3s, v = 60 \text{ m/s}$$

For  $a = -10 \text{ m/s}^2$

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

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

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

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

When the car comes to rest;  $v = 0 \text{ m/s}$

$$\therefore 0 = -10t + 150$$

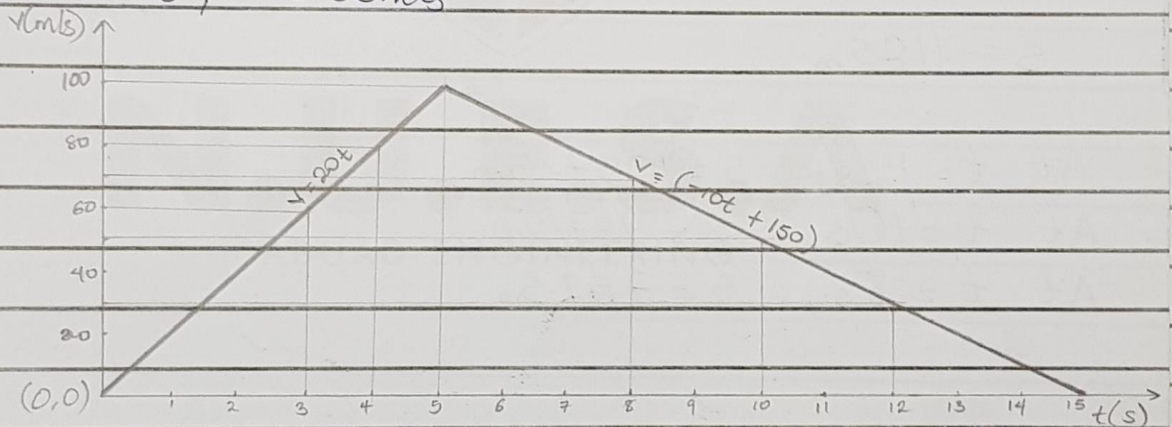
$$-150 = -10t$$

$$t = 15 \text{ sec.}$$

$$\text{At } t = 10s, v = 50 \text{ m/s}$$

$$\text{At } t = 8s, v = 70 \text{ m/s}$$

$$\text{At } t = 12s, v = 30 \text{ m/s}$$



F12-14

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

$$\int ds = \int v dt$$

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

$$\text{At } t = 5s, s = 375 \text{ m}$$

$$\text{At } t = 4s, s = 240 \text{ m}$$

$$\text{At } t = 2s, s = 60 \text{ m}$$

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

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

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

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

$$s - 375 = \left[ \frac{-15t^2}{2} + 225t \right] - 937.5$$

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

Total distance covered, se. at  $t = 15s$ ,

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

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

At  $t = 12s$ ,  $s = 1057.5 \text{ m}$

At  $t = 10s$ ,  $s = 937.5 \text{ m}$

At  $t = 8s$ ,  $s = 757.5 \text{ m}$

