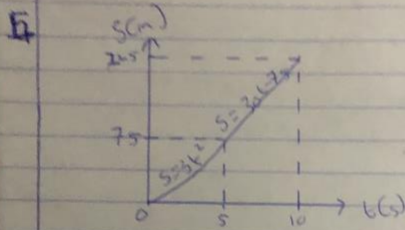
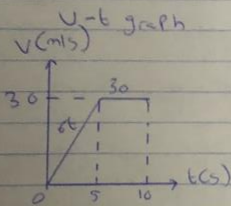


18/ENG05/005  
Mololuwa Adeniyi  
Mechatronics

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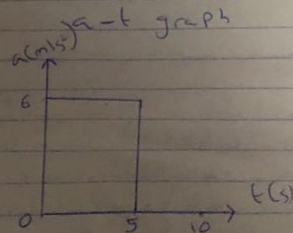


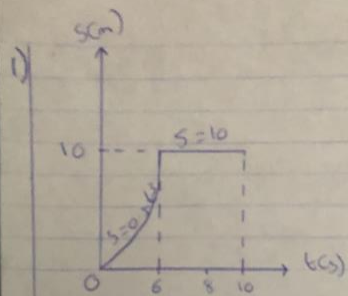
$$v = ds/dt \quad \text{at } t = 5s$$
$$v = 6t = 6 \times 5 = 30 \text{ m/s}$$
$$\text{at } t = 10s \quad v = 30 \text{ m/s}$$



4.ii)

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





$$v = ds/dt$$

$$v = 1.5t^2$$

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

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

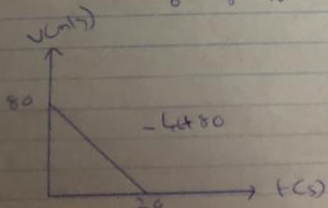
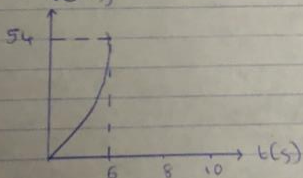
$$= 1.5 \times 36$$

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

$$\text{From } t = 6\text{s} - 10\text{s}, s = 10\text{m}$$

$$v = 0$$

$v-t$  graph



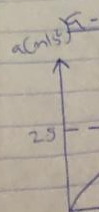
$$s = \int v dt$$

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

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

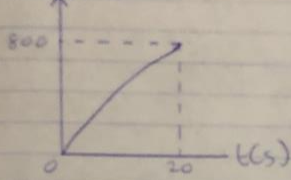
$$\text{at } t = 20\text{s}$$

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



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

$s-t$  graph  
(m)



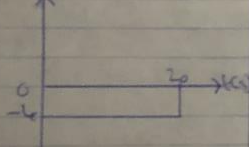
(ii) acceleration

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

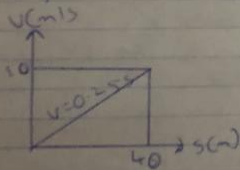
$$a = -4 \text{ m/s}^2$$

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

$a-t$  graph  
(m/s<sup>2</sup>)



3)



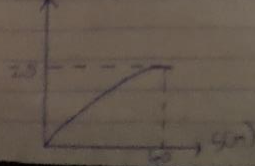
$$a = \frac{dv}{ds}$$

$$v = 0.25s$$

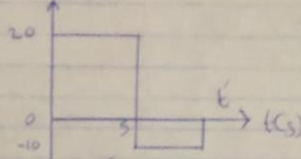
$$a = 10 \times 2(0.25)$$

$$a = 10 \times 0.25$$

$$\text{at } s = 20 \text{ m} : a = 2.5 \text{ m/s}^2$$



5)  
a/m



$$v = \int a dt$$

$$v = 20t$$

$$v = 20t$$

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

$$v = 20 \times 5 = 100 \text{ m/s}$$

$$\int_{100}^0 dv = \int_5^{15} -10 dt$$

$$v - 100 = -10t \Big|_5^{15}$$

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

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

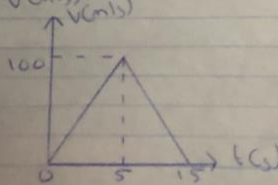
$$\text{at } t = 15 : v = 0$$

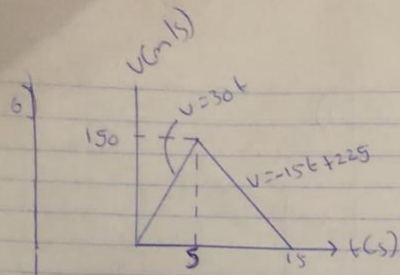
$$0 - 100 = -10t + 50$$

$$10t = 150$$

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

$v-t$  graph  
(m/s)





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

$$\int_0^5 v \, dt = \int_0^5 30t \, dt$$

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

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

$$S = 15 \times 25$$

$$S = 375_m$$

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

$$\int_{375}^S v \, dt = \int_5^{15} (-15t + 225) \, dt$$

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

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

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

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

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

$$S - 375 = +1687.5 - 937.5$$

$$S - 375 = 750$$

$$S = 1125_m$$

S-t graph

