MECHANICS

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MECHANICS

ENG234

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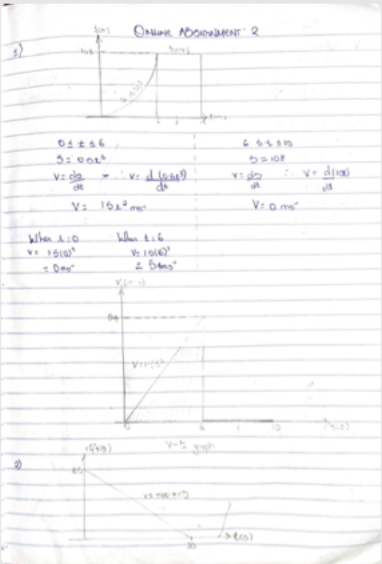

ONLINE ASSIGNMENT 2

1)

$0 \le t \le 6$: $s = 0.5t^3$

$v = \frac{ds}{dt} = \therefore v = \frac{d}{dt}(0.5t^3)$

$V = 1.5t^2 ms^{-1}$

When $t = 0$: $v = 1.5(0)^2 = 0 ms^{-1}$

When $t = 6$: $v = 1.5(6)^2 = 54 ms^{-1}$

$6 \le t \le 10$: $s = 10t$

$v = \frac{ds}{dt} \therefore v = \frac{d}{dt}(10t)$

$V = 0 ms^{-1}$

2)

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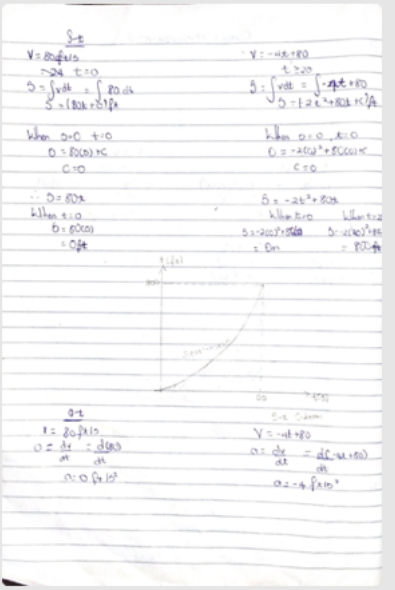
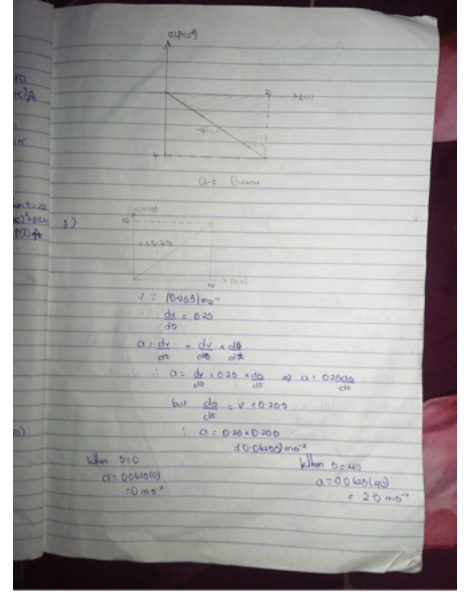




2)

$v = (0.25t)\ ms^{-1}$

$\frac{dx}{dt} = 0.25$

$a = \frac{dv}{dt} = \frac{dv}{d\theta} \times \frac{d\theta}{dt}$

$\therefore a = \frac{dv}{d\theta} \times 0.25 \times \frac{d\theta}{dt}$ $\Rightarrow a = 0.25\omega$

but $\frac{d\theta}{dt} = v = 0.25t$

$\therefore a = 0.25 \times 0.25t$

$a = (0.0625t)\ ms^{-2}$

When $t=0$

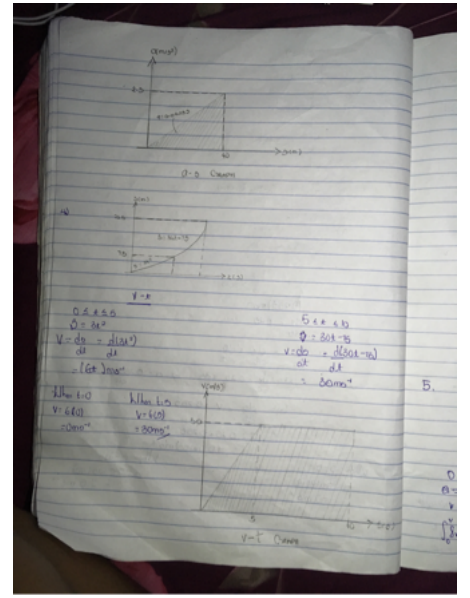
$a = 0.0625(0)$

$= 0\ ms^{-2}$

When $t = 4\pi$

$a = 0.0625(4\pi)$

$= 2.5\ ms^{-2}$



Q-4

$0 \le t \le 5$

$s = 5t^2$

$a = \frac{d^2s}{dt^2}$

$= \frac{d}{dt}\left(\frac{ds}{dt}\right) = \frac{d}{dt}(10t)$

$= 4\,ms^{-2}$

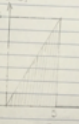
$5 \le t \le 10$

$s = 30t - 75$

$a = \frac{d^2s}{dt^2}$

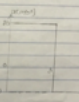
$= \frac{d}{dt}\left(\frac{ds}{dt}\right) = \frac{d}{dt}(30)$

$= 0\,ms^{-2}$



Q-t Graph

B.



$0 \le t \le 10$

$a = 20\,ms^{-2}$

$v = \int a\,dt$

$\int_0^v dv = \int_0^t 20$

$v = 20t$

$10 \le t \le 15$

$a = -10\,ms^{-2}$

$\int_{20}^{v} dv = \int_{10}^{t} a\,dt = \int_{10}^{t} -10$

$\int_{20}^{v} dv = \int_{0}^{t} -10$

When $t = 0$, $v = 20(0) = 0\,ms^{-1}$

When $t = 10$, $v = 20(10) = 200\,ms^{-1}$

$V - 100 = [-10(t)] - (-10(10))$

$v - 100 = -10t + 100$

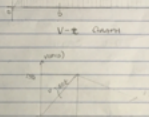
$v = (-10t + 100)\,ms^{-1}$

When $v = 0$, $t = ?$

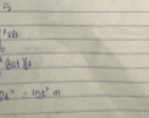
$0 = -10t + 100$

$10t = 100$

$t = 10\,Secs$



V-t Graph



$0 \le t \le 5$

$v = 30t$

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

$s = 30t^2 - 10t^2\,m$

$5 \le t \le 10$

$v = 10t + 20s$

$\int_{30}^{s} ds = \int_{5}^{t} (10t + 20)\,dt$

$\int_{30}^{s} ds = \int_{5}^{t} [(-10t + 20)]\,dt$

$s - 375 = \left[\frac{-10t^2}{2} + 20t\right]_{5}^{t}$

When $t = 0$

$s = 15(0)^2$

$= 0\,m$

When $t = 5$

$s = 15(5)^2$

$= 375\,m$

$s - 375 = [(7.5t^2 + 225t) - (7.5(5)^2 + 225(5))]$

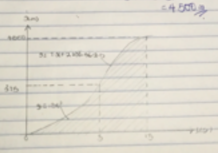
$s - 375 = [(7.5t^2 + 225t) - (937.5)]$

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

When $t = 15$, $s = ?$

$s = 7.5(15)^2 + 225(15) - 562.5$

$= 4500\,m$



S–t Graph