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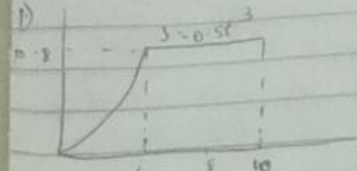
18/Eng06/058.

Mechanical Engineering

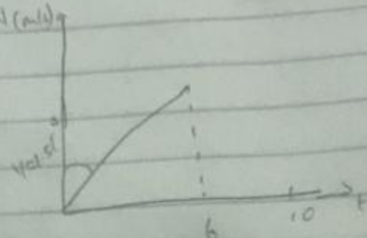
Mechanics Assignment.

1)



$s = 0.5t^3$ at $t =$

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

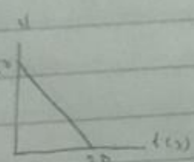


$6 < t \leq 10$; $s = 108$

$v = \frac{ds}{dt} = 0$

$v = 1.5(6)^2 = 54\ m/s$

2) $v = -4t + 80$



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

$= \left[\frac{-4t^2}{2} + 80t \right]$

$-2t^2 + 80t$

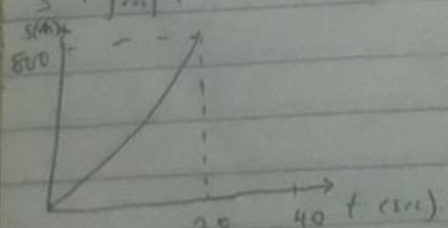
$0 < t < 20s$

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

$s = -800 + 1600$

$s = 800$

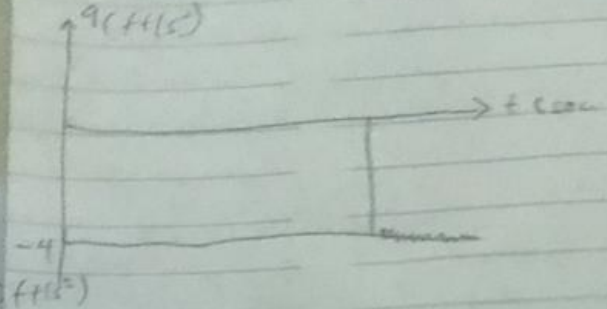
s - T graph



$v = (-4t + 80)$

$0 < t < 20s$

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



$a(ft/s^2)$

3) $v = (0.25s)\ m/s$

$a\,ds = v\,dv$

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

$\frac{dv}{ds} = 0.25$

$a = (0.25s)(0.25)$

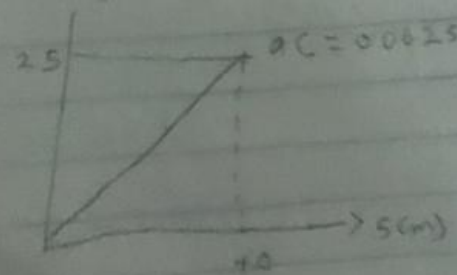
$a = 0.0625s\ m/s^2$

At $s = 40m$

$a = 0.0625 \times 40$

$a = 2.5\ m/s^2$

a-s graph



a) $s = 3t^2$

$0 < t < 5sec$

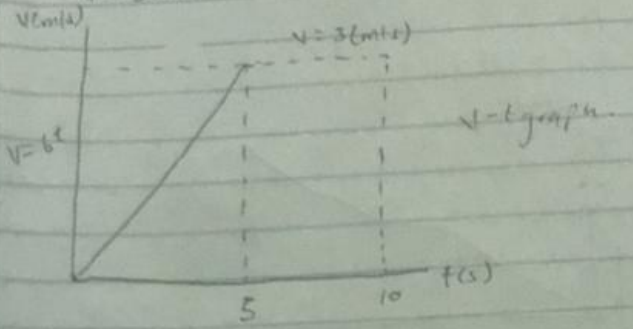
$v = \frac{ds}{dt} = 6t$

$v = 6 \times 5 = 30 m/s$

$5 < t \leq 10 sec$

$s = 30t - 75$

$v = 30 m/s$



$v = 6t m/s$

$0 \leq t \leq 5sec$

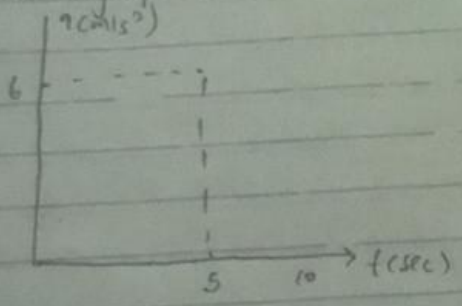
$a = \frac{dv}{dt} = 6 m/s^2$

$v = 50 m/s$

$5 \leq t \leq 10 sec$

$a = \frac{dv}{dt} = 0 m/s^2$

a-t graph



5) $0 \leq t \leq 5sec$

$a = 20 m/s^2$

$dv = a\,dt$

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

$v = 20t$

when $t = 5$ $v = 20 \times 5$

$u = 100\ m/s$

$5 \le t \le 10\ sec$

$a = -10\ m/s^2$

$\int_{100}^{v} dv = \int_{5}^{t} -10\,dt$

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

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

$v - 100 = -10t + 50$

$v = -10t + 150$

$v = 0$

$0 = -10t + 150$

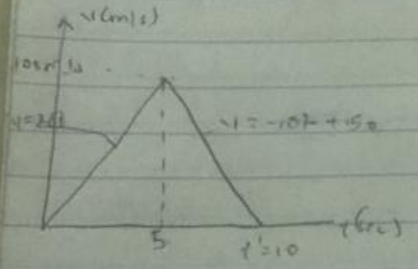
$10t = 150$

$t = 150/10 = 15\ sec$

$5 \le t \le t'$ $t' = 15\ sec$

$v = -10 \times 15 + 150$

$v = 0$



6) $0 \le t \le 15\ sec$

$0 \le t \le 5\ sec$ $v = 30t$

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

$s = 15t^2$

$s = 15(5)^2$

$s = 375\ m$

$5 \le t \le 15\ sec$ $v = -15t + 225$

$\int_{375}^{s} ds = \int_{5}^{t} (-15t + 225)\,dt$

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

$s - 375 = \frac{-15t^2}{2} + 225t - \left[\frac{-15(5)^3}{2} + 225(5)\right]$

$= \frac{-15t^2}{2} + 225t + 1312.5$

$s = \frac{-15t^2}{2} + 225t + 1312.5 + 375$

$s = \frac{-15t^2}{2} + 225t + 1687.5$

$s = \frac{-15(15)^2}{2} + 225(15) + 1687.5$

$s = 3375\ m$