(iv) overall Efficiency = $\frac{\text{fluid power}}{\text{shaft power}}$

$= \frac{1249.5}{2670.35} = 0.468$

$= 0.468 \times 100 = 46.8\%$

DATE:

5) $Q = 0.05m^3/min = 50dm^3)$

$P_0 = 15 bar = 15 \times 100000 = 15 \times 10^5 N/m$

$N = 1200$ r/m

$T = 15$ Nm, ND = 10 cm/rev

(i) Volumetric Efficiency = $\frac{\text{Actual flow}}{\text{Initial flow}}$

= 10cm/rev × 1700 rev/m

= 17000 cm/min

Ideal flow rate = $\frac{17000}{1000000} = 0.017m^3/min$

Actual flow rate = 0.05m²/min

Volumetric Efficiency = $\frac{0.05}{0.017} = 2.94\% = 294\%$

(ii) fluid power = P × Q

$P = 15 \times 10^5$

$Q = 0.05 = \frac{0.05}{60} = 8.33 \times 10^{-4}$

fluid power $= 15 \times 10^5 \times 8.33 \times 10^{-4}$

= 1249.5 watts

(iii) shaf power $= \frac{2\pi NT}{60} = \frac{2 \times \pi \times 1700 \times 15}{60}$

= 2670.35 watts

DATE:

$= Q = \frac{C_d \sqrt{2gh} \times A_1 A_2}{\sqrt{A_1 - A_2}}$

$Q = \frac{0.64 \times \sqrt{2 \times 9.81 \times 705.51} \times 706.86 \times 176.72}{\sqrt{(706.86)^2 - (176.72)}}$

$Q = 137443.29$ cm

$Q = \frac{137443.29}{1000} = 137.44$ Lt/s

4) $x = 0.17$m

$S_g = 13.6$

$S_0 = 1.026$

$V = ?$

$V = \sqrt{2gh}$, $h = ?$

$h = x\left[\frac{S_g}{S_0} - 1\right] = 0.17\left[\frac{13.6}{1.026} - 1\right]$

$\therefore V = \sqrt{2 \times 9.81 \times 2.0884} = 6.393$

$\frac{6.393 \times 60^2}{1000} = 23.0$ km/hr

DATE:

$$= \frac{0.98 \times \sqrt{2 \times 9.81 \times 2208} \times 314.16 \times 78.54}{\sqrt{(314.16)^2 - (78.54)^2}}$$

$$= \frac{0.98 \times 2081.37 \times 24674.1264}{304.184112}$$

$= 165455.3$ cm

$= \frac{165455.3}{1000} = 165.45567$ l/sec

3) $D_1 = 30$ cm

$A_1 = \frac{\pi (30)^2}{4} = 706.86\,cm^2$

$D_2 = 15$ cm

$A_2 = \frac{\pi d^2}{4} = \frac{\pi (15)^2}{4} = 176.72$ cm

$S_o = 0.9$

$S_{hg} = 13.6$

$x = 50$ cm of mercury

$C_d = 0.64$

$h = x\left(\frac{S_{hg}}{S_o} - 1\right)$

$h = 50\left(\frac{13.6}{0.9} - 1\right)$

$h = 705.56$ cm

DATE:

$\frac{2.5 + 3^2}{2 \times 9.81} + 2.0 = P_2 + \frac{2^2}{2 \times 9.81} + 0 + 0.1$

$= 5.774 - 0.365 = P^2$

$P_2 = 5.409 m$

2) $D_1 = 20 cm$

$D_2 = 10 cm$

$A_1 = \frac{\pi D^{1^2}}{4} = \frac{\pi (20)^2}{4} = 314.16 cm^2$

$A_2 = \frac{\pi D^3}{4} = \frac{\pi (10)^2}{4} = 78.54 cm^2$

$\rho = 1000 kg$

P of inlet = 17.658

$\frac{P_1}{\rho g} = \frac{17.658 \times 10^4}{1000 \times 9.81} = 18m$

$\frac{P_2}{\rho g} = -30cm, \; Sg_{Hg} = 13.6$

-30×13.6

$= 4.08 m$

Using, $Q = \frac{Cd \sqrt{2gh} \cdot A_1 A_2}{\sqrt{A_1^2 - A_2^2}}$

DATE:

Name: Nkanga, Ekomabasi Imo
Matric: 18/ENG02/061
DEPT: Computer Engineering

1. Length, $L = 2.0m$
Velocity$_1$ $= 5m/s$
$V_2 = 2m/s$
$P_2 = 2.5m$ of Liquid

$$H_2 = \frac{0.35(V_1 - V_2)^2}{2g}$$

$$= \frac{0.35(5-2)}{2 \times 9.81} = 0.161m$$

$P = ?$

Applying Bernoulli's Equation

$$\frac{P_1}{\rho g} + \frac{V_1^2}{2g} + Z_1 = \frac{P^2}{\rho g} + \frac{V_2^2}{2g} + Z + H$$

Where $P = \frac{P_1}{\rho g}, \frac{P_2}{\rho g}$

$Z_1 = 2.0$ and $Z_2 = 0$

DATE:

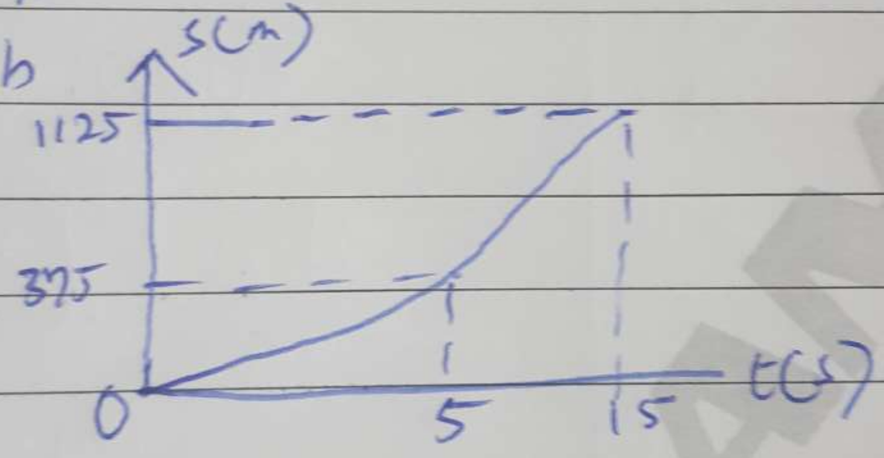
6) $s - 375 = (-1687.5 + 3875) - (-187.5 + 1125)$

$s - 375 = 1687.5 - 987.5$

$s - 375 = 750$

$s = 1125$

s - t graph



DATE:

5) i. $v = \int a\,dt$

$v = \int 20\,dt$

$v = 20t$

at $t = 5s$

$v = 20 \times 5 = 100\,m/s$

$5s < t < t$

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

$v - 100 = -10t \Big|_{5}^{t}$

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

$v = 100 - 10t + 50$

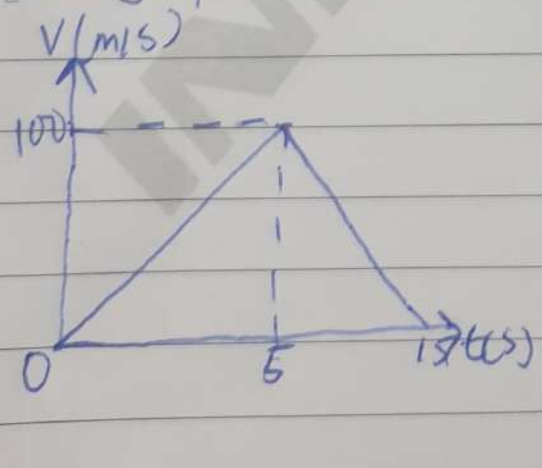
at $t = 0$, $v = 0$

$0 - 100 = -10t + 50$

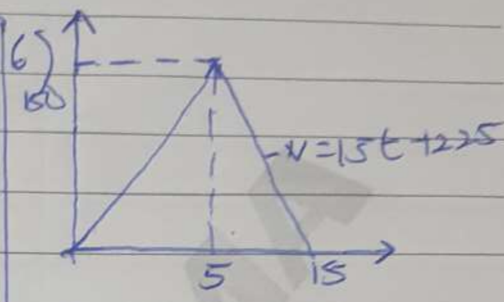
$10t = 150$

$t = 15s$

v - t graph



6)



$0 \leq t \leq 5$

$v = 30t$

$\int_{0}^{s} ds = \int_{0}^{5} 30t$

$S = 15t^2 \Big|_{0}^{5}$

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

$s = 15 \times 25$

$S = 375$

$5s \leq t \leq 15$

$V = -15t + 225$

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

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

DATE:

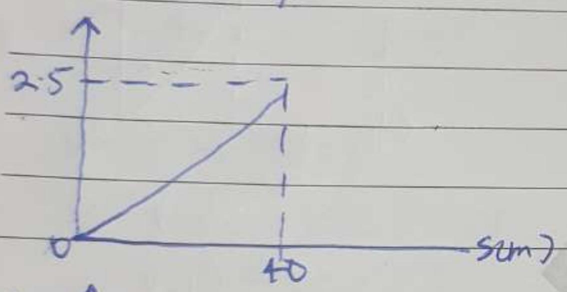
3) $a = \left(\frac{dv}{ds}\right)v$

$v = 0.25s$

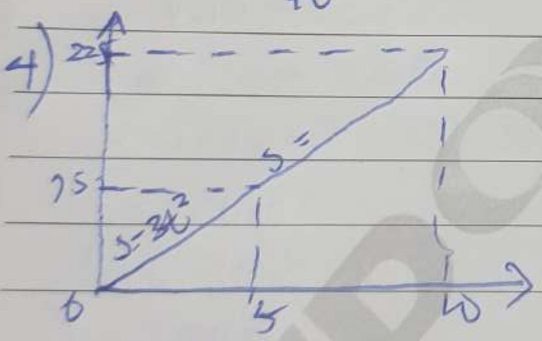
$a = 10 \times d(0.25s)/ds$

$a = 10 \times 0.25$

$a = 2.5 m/s^2$



4)



$v = ds/dt$

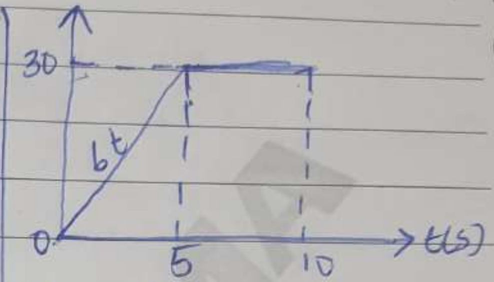
at $t = 5s$

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

at $t = 10s$

$v = 30 m/s$

v–t graph



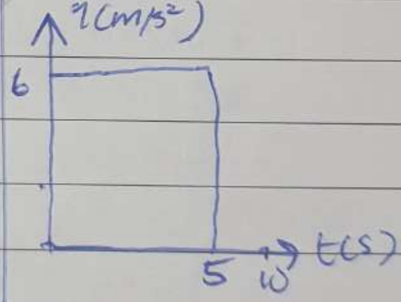
ii) $a = dv/dt$

at $t = 5$

$a = 6 m/s^2$

at $t = 10$

$a = 0 m/s^2$



5)