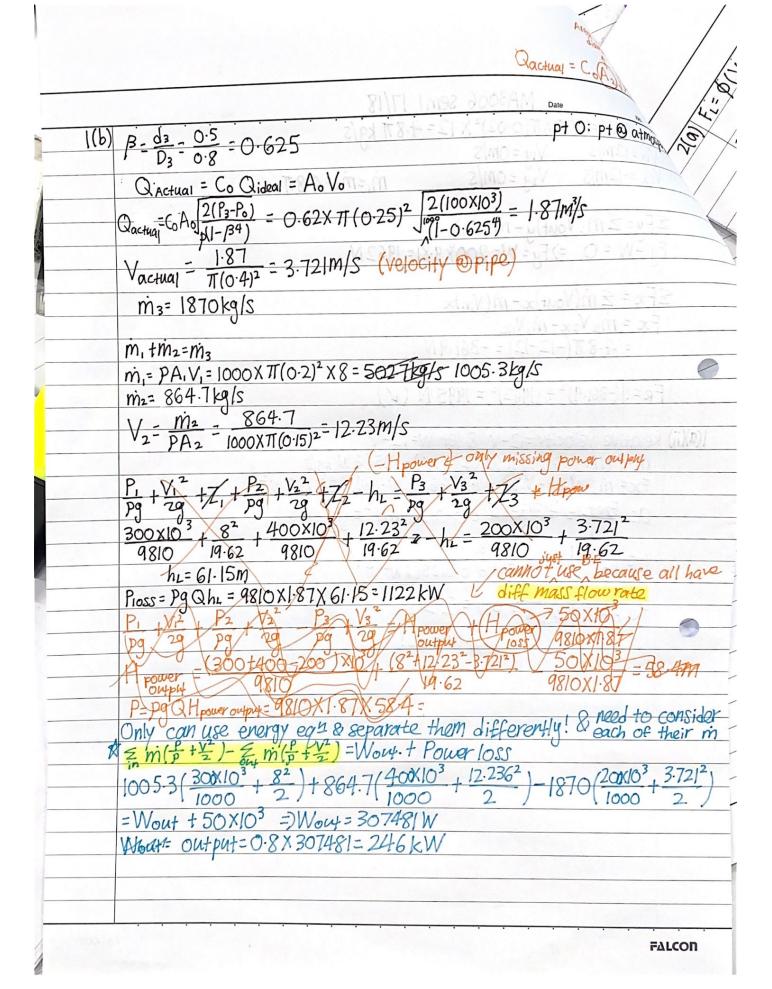
| | MA3006 Sem 17/18 Date No. |
|--|--|
| ((a)(;) | $\dot{m} = PAV = 1000 \times \pi (0.02)^2 \times 12 = 4.8 \pi \text{ kg/s}$ $V_{1x} = 12 \text{ m/s}$ $V_{1y} = 0 \text{ m/s}$ $V_{2x} = -12 \text{ m/s}$ $V_{2y} = 0 \text{ m/s}$ $\dot{m}_1 = \dot{m}_2 = 4.8 \pi$ |
| /// | $V_{1}=12$ m/s $V_{1}=0$ m/s |
| | $V_{2x} = -12m/5$ $V_{2y} = 0m/S$ $\dot{m}_1 = \dot{m}_2 = 4.8\pi$ |
| | 122 121115 129 00.72 |
| | $\sum F_{ij} = \sum \dot{m}(V_{out})_{ij} = \dot{m}(V_{in})_{ij}$ |
| | $\Sigma F_y = \Sigma \dot{m}(V_{out})_y - \dot{m}(V_{in})_y$ $F_y - W = 0 \Rightarrow F_y = W = 200 \times 9.81 = 1962 N$ |
| | rg - W - O 71g - W - 200 K 1 01 1 1 1 1 |
| | $\Sigma Fx = \Sigma \dot{m}(Vout)x - \dot{m}(V_{in})x$ |
| | ZFX-ZIII VOUT/X-1/1 (1,11/2 |
| | $F_{x} = \dot{m}_{2} V_{2x} - \dot{m}_{1} V_{1x}$ = $4.8 \pi (-12-12) = -361.9 N$ |
| (III) | = 4.8 /1 (-12 12) - 301·11· |
| City of the city o | $F_{R} = \sqrt{(-361.9)^2 + (1962)^2} = 1995 N (2)$ |
| | FR= 1(-361.7) + (1902) - 1993 1V (4) |
| 1601() | 10-1-17-12 valacily-12 V 8 lot W=12-V |
| 1(a)(11) | Relative velocity = 12-V & let W= 12-V |
| | \dot{m} =PWA = $1000 \times \pi (0.02)^2 (W) = 1.2566 W kg/s$ Fig: $\dot{m} (W_{in} - W_{out}) = 1.2566 W (W - (-W)) = 2.5132 W^2$ |
| | Fix= m (Win-Wow) = 1.2300 W(W 1 win = 2 3 3 2 4) |
| | $G = \frac{m(W_{10} - W_{04})^{2} - 12300W(W_{1}W_{1}^{2} - 200)}{m - 200} = 0.012566W^{2} - dV}$ |
| | m 200 |
| | t-53 1 dV-53 1 t-Jo a dV-50 0.012566W2 dV |
| ed lie | |
| | $=\int_{0.012566(12-V)^{2}}^{3} dV = 2.215$ |
| | J 0 0.012566 (12-V) |
| 90 | just use Ec! |
| 91 1 | |
| all P | Chalch Cart |
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| | 4 124105 EREONE BONGE |
| | March Charlet Charlet Control of the |
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| 2(0) | Fig (VI) S N C D M) | Date No. |
|------|---|--|
| 2(u) | FL= Ø(V, 1, S, X, C, P, M) | use P, V, 1 as params |
| | T = E (0)9(1,1)b(0)C | 5Л grps no щ П,: FL, П2: S, П3: & |
| | $\pi_{i} = F_{L}(p)^{a}(V)^{b}(\lambda)^{c}$ | T. C. T. 14 |
| | $= \frac{kg m}{s^2} \left(\frac{kg}{m^3}\right)^a \left(\frac{m}{s}\right)^b (m)^c$ | П4: С, П5: M |
| | | $F_L = kg\left(\frac{m}{S^2}\right)$ S=1 |
| | kg: Ita=0=a=-1 m: 1-3atb+c=0=) I+3-2+c=0=>c=-2 | $C = \frac{m}{S}$ |
| | S:-2-b=0=b=-2 | |
| | | $M = kg\left(\frac{m}{s^2}\right)\left(\frac{s}{m^2}\right) = \frac{1}{k}$ |
| | $TI_1 = \frac{F_L}{p_{V^2} y^2}$ | Later Francis and a six |
| | 7 V X | mail indicates 1115 |
| 0 | $\Pi_2 = \frac{S}{\Lambda} & \Pi_3 = \frac{C}{V} & \Pi_4 = V$ | |
| | 112- 1 4 113- V 4 114-W | sionless |
| | Tr = M(D)9/V)b/11° | d |
| | $T_5 = M(p)^a(v)^b(\lambda)^c$ $-\frac{kg}{ms} \left(\frac{kg}{m^3}\right)^a \left(\frac{m}{s}\right)^b (m)^c$ $Re = \frac{pva}{m}$ | d & 1 & d has the same parame |
| | $\frac{-Rq}{r}$ $\frac{Rq}{m_3}$ $\frac{r}{s}$ $\frac{r}{s}$ $\frac{r}{s}$ | |
| | | K. Maria and Maria |
| | kg: +a=0=)a=-1 m:-1-3a+b+c=0=) c=-31 | Not in the selection |
| | S: -1-b=0=>b=-1 | |
| | - M | 7. 30 . 1 . 1 . 1 . 1 . 1 . 1 . 1 . 1 . 1 . |
| | $T_S = \frac{M}{PV\lambda}$ | conduction and contact |
| | 19/12=11= 5/0 | 0 50 |
| (8) | FL-dISC, MI | |
| | $\frac{F_L}{pv^2\lambda^2} = \phi\left(\frac{S}{\lambda}, \frac{C}{V}, \chi, \frac{M}{pv\lambda}\right)$ | |
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| 2(b) | Ma Mm | lp = 20 & lm=1 | Mm=1.82×10-5 |
|---------|---|---|--|
| The Oil | Pp. Jp. Vp Pm. In. Vm 1.57×10-5 1.82×10-5 | 1p=20 & lm=1 Mp=1.57X10-5, Pp=1.514 | Pm= 1.204 |
| B. at. | 1.57X10-5 1.82X10-5 | // | (Augusta) As No. |
| | 1.514×20Vp - 1.204 Vm | | Maria Cara Cara |
| m-5 | Vp = 0.0343 | | 8 / 8/4 / -2" |
| | Vm | | 1-:0::0::0::0://www.rpdi |
| | (FL)p - (tr)m -)(| F.) - (FL)m (Pp) (Vp)2/1 | P 2 18508-1 m |
| | Tolog PmVmlm | $F_{L})_{p} = \frac{(F_{L})_{m}}{(P_{m})} \left(\frac{P_{p}}{V_{m}}\right)^{2} \left(\frac{J_{p}}{J_{m}}\right)^{2} \left(\frac{J_{p}}{J_{m$ | m/a=0=8-2-18 |
| | (FL)p=1.20) (1.20 | $(0.0343)^{2}(20)^{2} = (0.74)^{2}$ | <n -<="" td=""></n> |
| 2(c) | For laminar flow | | 3.46 4.5 |
| | For laminar flow, $V_{avg} = \frac{V_c}{2} = \frac{\Delta PD^2}{32\mu M}$ | 20 = SI 16 T | |
| | Vavg 2 = 32/41 | | V 7 81 72 8 7518 |
| - ann | $Q = AV ; V = V_{aVg}$ $Q = \frac{\pi}{4} D^{2} \frac{\Delta PD^{2}}{32/M_{A}} = \frac{\pi D}{128}$ | LUA COLAGO | PAN PAR TON |
| | Q-TD2 APD2 TD | OF AP (Shown) | in the particular to |
| | 4 32/4 128 | 8MX (GNOSTI) | 1 Lips 3 a |
| | D DVJ PON | 1 200/0 00075) | 1-00-0-0-1-64 |
| | Re= 100 =) V= Re/ | $\frac{1}{10000000000000000000000000000000000$ | 10=Otarlor - m |
| | Vc= 2(0.0190) = 0.0 | 380M/s | |
| | AP _ 16/4/c _ 16(0.00 | 0025)(0.0380) - 1521/23 | N/4 75 1 |
| | $\int_{0}^{\infty} D^{2}$ | $\frac{1050\times0.01}{380\text{m/s}} = 1.52\text{N/m}^3$ | Cont. |
| | | Commence of the second | 0 3 1 1 5 |
| | | \ Me (A) | 1117-44 |
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| 3(a) | $P_1 	 V_1^2 	 P_2 	 V_3^2 	 O_{12}$ | V ₁ = V ₂ |
|---------|--|---|
| 7(0) | Pg + V1/2 + Z1 - h_ = P2 + V2/2 + Z2 & h_ = Sd V2/2 | $Z_1 = Z_2 = 0$ |
| | 1 - P1-P2-AP - 0 1 V2 | 21-22-0 |
| | $h_L = \frac{P_1 - P_2}{pq} = \frac{\Delta P}{pq} = \frac{S}{2} \frac{V^2}{\sqrt{2}}$ | |
| | $\Delta P = S \frac{1}{d} \frac{1}{2} PV^2 \Rightarrow V = \frac{2\Delta P}{S} \frac{d}{d} \frac{1}{P} $ (shown) | |
| | Since laminar flow, | |
| - | $f = \frac{64}{Re} = \frac{64M}{PVd} = \frac{64(0.001)}{1000V(0.01)} = \frac{4}{625V}$ | |
| | Re PVd 1000V(0·01) 625V | |
| | 500 = 4 × 10 × 500 VZ => 500 = 3200 V => V = 0.156 | 25m/s |
| | $Q = AV = \pi (0.005)^2 \times 0.15625 = 1.23 \times 10^{-5} \text{ m}^3/\text{s}$ | |
| 0(1) | 0 2 6/ | |
| 3(6) | $\frac{P_{A}}{pg} + \frac{V_{A}^{2}}{Z_{A}} + \frac{P_{B}}{Z_{A}} + \frac{V_{B}^{2}}{pg} + \frac{V_{B}^{2}}{Z_{g}} + \frac{V_{B}}{Z_{B}}$ $V_{A} @ tank = 0$ | 1/ 10 |
| | pg /2g /2A /12-/pg /2g /2B //A @ tank => | VA=U |
| | Protection Ve @pipe => | AR = A1 |
| | $\frac{P_A}{Pg} = 3.5 \frac{V_1^2}{2g} - 2 \Rightarrow P_A = 3.5 (1000) V_1^2 - 2 (9810)$ | |
| | $\sqrt{\frac{3.5(1900)}{3.5(1000)}}$ $\sqrt{\frac{3}{10000}}$ $\sqrt{\frac{3}{10000}}$ -6.32 m/s | |
| 3(b)(i) | $\frac{P_0}{P_0} + \frac{V_0^2}{Z_0} + \frac{V_0^2}{V_0} $ | |
| 0 | VIF 12(0) | ameter is diff) |
| | $\frac{120\times10^{3}+2-2.5\frac{V_{1}^{2}}{29}+\frac{V_{2}^{2}}{29}}{120\times10^{2}+2} = \frac{120\times10^{3}+2}{29} = \frac{120\times10^{3}+2}{2$ | |
| - No. | 9810 12 23 29 Velocity read | Q = 127.32 |
| | $\frac{14.232 - \frac{2.5}{19.62} (127.32Q)^2 - \frac{1}{19.62} (2637.18Q)^2 - 0}{14.232 - \frac{2.5}{19.62} (127.32Q)^2 - \frac{1}{19.62} (2637.18Q)^2 - 0}$ | 11(0.05)- |
| | $7135890^2 = 14.237 \Rightarrow 0 = 0.00816m^3/c$ | $\frac{Q}{\pi(0.05)^2} = \frac{ 27.320}{ 27.320}$ $\frac{Q}{\pi(0.0125)^2} = \frac{2037.18}{ 27.320}$ |
| | 1/ - 1/27 10/M MMO// = 1/ (- ///M/) | 11[0.0120] |
| | $V_2 = 2031.18(0.00810) - 16.629m/3$ velocity head $-\frac{16.629^2}{19.62} - 14.1m$ | |
| | @ owlet 19.62 - 14.1M | |
| | | |
| (b)(ii) | Power_PgQHp_9810(0.00816)(Hp)=?? | |
| 2 //// | input - N | |

| 2/11/11 | | | | Date | No. |
|------------|--|--|-----------|--|-----------|
| 3(p)(ii) 1 | 1p +2 = 25 V12 + V2 ower = pgQHp = 9810(0 nput = 101 | 2 -2 = 213 | 589 (0.00 | $1816)^2 - 2 = 12$ | 22m |
| P | ower: pa()Hb -9810(0 | 00816)(12.22) | Long | 11/ | 9 7 |
| i | nput - TON - TOTO | 0.7 | 3/3/8 | SVV PA | - 11 |
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| 3(b)(iii) | | 1 4 5 | 1 | 1200 | |
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| | for (i) | 1 | Pump | for (ii) | CHGL) |
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| 4(a) E= (Z2 | -Z1)+S11 V12 +S2 12 V22 | V ₁ ‡V ₂ (diameter diff) |
|-----------------------------|--|---|
| $V_1 = \frac{Q}{\pi(0.15)}$ | $\frac{1}{(525)^2} = 13.687Q$ & $V_2 = \frac{Q}{17(0.125)^2}$ | = 20·372Q V= Q |
| E=(Z2- | 71) + fili 1 (Q)2 + fili 1 d2 29 (A1)2 + d2 29 (| $ \begin{pmatrix} Q \\ A_2 \end{pmatrix}^2 \qquad A = \frac{\pi}{4} d^2 $ $ \frac{1}{A} = \frac{4}{\pi d^2} $ |
| E=(Z | Z) + Sili 1 Q2 + Sili 1 | Q^2 |
| E=(Z ₂ | $\frac{Z_1}{2g(\frac{\pi}{4})^2} \left[\frac{S_1 l_1}{d_1^5} + \frac{f_2 l_2}{d_2^5} \right] Q^2 =$ | $\frac{(4d_2)}{E = (Z_2 - Z_1) + 0.08262 \left[\frac{S_1 l_1}{d_1^5} + \frac{f_2 l_2}{d_2^5} \right] Q^2}$ shown |
| | +0.08262(1822.7)Q2 => E= 6+15 | |
| Opera | ating flow - Pump Chara & system | Chara |
| r | ating flow - pump chara & system ate intersection | Crion of |
| Power | flow= Pa Qho | |
| Inpu | t power_Pgahp Jon't have | 2 graph |
| requ | lired 12 but must o | vrite down the steps! |
| | | <u>'</u> |
| Thorn | ation will likely occur 64 the pump. | |
| Hah | is no energy input frm suction surfaces Since velocity is constant, HGL like gy is used to gain height & overcome | ace up to the point 64 the pump |
| anor | The Since velocity is constant, HGL like | by to dip below the datum line as |
| e e e | 14 is used to gain neight & overcome | 'friction |
| 4(h)(iii) PP | V ₂ ² D D V ² | 1/2 - 1 |
| pq | V + Vs2 + Zs - Pi-Pv + Vi3 + Zi-hi | $V_1 \otimes tank = V_1 = 0$ |
| Ps-Ps | 1 V2 PI-PV 17 7 (1) | |
| pq | | |
| 0 | 100×103 = 2750 | .00 |
| NPS | $\frac{1}{29} - \frac{1}{100} 1$ | $\frac{262}{15}$ $\frac{31}{15}$ $\frac{31}{15}$ $\frac{31}{15}$ |
| NPSH | 1 _A > NPSH _R =) cavitation will not occur | r 01 / |
| NPSH | ta < NPSHR =) cavitation will occur | |
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| TE HD < NA? | Ha =) pump is not suitable | <u> 20 - 20 - 20 - 20 - 20 - 20 - 20 - 20 </u> | 44.7 |
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