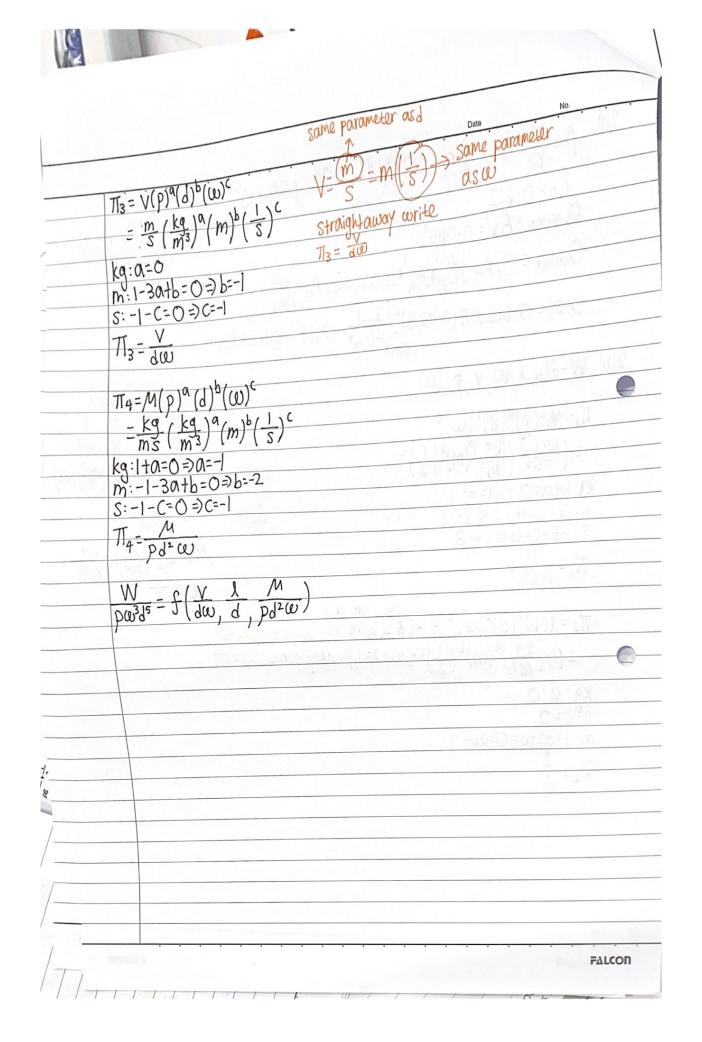
		MA3006 sem 2 1	8/19	Date	1 1/4/4
l(a	Opoint 1 to 2 Opoint 2 to 3	S	et ptAbept4 etptBbept3		
)(a)(i) EFx= Em(Vout) O = m4V4x-1	x-m (V;n)x m3V3x-m2V2x	0 - 0.30338	Vgr V3=V3x V3y=V4y=	& V4=V4x =0
	EFy= Em(Vout) -25= O-m2V2y	y-m(Vin)y	5 1 C C 1 C C 1 C C C C C C C C C C C C	251.01.01.00 251.01.01.00	(1960) (1964) (2)
[(a)(i	$ \frac{P_{1}}{P_{2}} + \frac{V_{1}^{2}}{2g} + \frac{V_{1}^{2}}{2g} + \frac{V_{1}^{2}}{2g} + \frac{V_{1}^{2}}{2g} + \frac{V_{1}^{2}}{2g} + \frac{V_{1}^{2}}{2g} + \frac{V_{2}^{2}}{2g} + \frac{V_{2}^{2}}{2g} + \frac{V_{1}^{2}}{2g} + \frac{V_{1}^{2}$	$\frac{92}{pg} + \frac{V_1^2}{2g} + \frac{7}{2} = \frac{1}{2} = \frac{1}{2}$	$\frac{1}{2} = \sqrt{\frac{2}{2} + 4(9.81)}$ $\cos 60^{\circ}$	$=)V_2=\sqrt{10^2-4}$	(9-81)=7-79m/s
change	$M_2 = M_3 + M_4 = 0$ $O = M_4 (7.79) - 0$	m3(7.79)-3.703(7.7	9 cos 60°) 3 toriri	2 eq ºs the waste time :	n use GC:
-	A= 3.703 A= 3.703 [000×10]	3-703XIO ⁻⁴ m² & A :	$\frac{\pi}{4} d^2 = d = 4$	PA = 0.021	7m

		71091	Date	/
$\frac{2}{1}$ $\frac{Q}{nA}$	T=mR(Vre	7	R= 0. 18m (circu r= 0.004m (noz	Ilar Zle)
- 0:005 - 4(π)(0:004)= 24.868m/s	m=0.005)	x1000=51g/s	-5)
n T=0,		x(nV)	M-se(100) M= ed)	19(0) 2
24.868cos	30°-119.6 rad/	1. 18(0) OF ju	18t USE - Vrei COSF-KU) = () a
0:18	- 111 0 [NIO]	p(m)	1) in - without me = wis	3
n W=10rad	/s		000 cm - 0 - 62	- Watt
0(0.18)(24.8	368cos 30°-0·18	X10) = 17.76N1	n	Care C
		41/6 = 51 = 1	1 - 2 - 1 - W - Y	1
1=0 (Shown	7	177 P	pd to be be	4
	1 00 00	11.1.277. X	00.000	4
		411,14	- 1-14(OSO)	1
WT 1210 .	Court Police	ing 2 Townstand	m2= m2+m2=3708	114
C SAIP GOLD	without a	1433	LISH TO THE CO	
		21.0-12.67.0 air	1 (= 2/0) 25P-0 = ein	
			me=2-18/4/5 = ma	37/
			VAG and great	
7120-0 -	T 1-0 = 0 T	10 to 2 2 A-	15-10 = 2703	
			DIADUM TO	
				1
	n T=0, 5(0· 18)(2 24.868cos 0:18 n @=10rad 5(0:18)(24.8	n T=0, 5(0: 18)(24.868cos30°-0 24.868cos30°-119-6 rad/ 0:18 - 119-6 rad/ n W=10rad/s	n T=0, 5(0. 18)(24.868cos30°-0. 18w) OF ju 24.868cos30°-119.6 rad/s 0:18 n W=10rad/s 5(0:18)(24.868cos30°-0:18×10) = 17.76Ni	$m = 0.005$ $-4(\pi)(0.004)^2 = 24.868 \text{m/s}$ $m = 0.005 \times 1000 = 5 \text{kg/s}$ $m = 0.005 \times 100$

	Date No.
$\beta = \frac{48}{80} = 0.6$ & Re= $\frac{1000 \times 1.99 \times 0.08}{1.002 \times 10^{-3}} = 1.588 \times 10^{5}$	m=PAV
	V=10 1000×TI(0.04)
Co= 0.612	1000X71(0.04)
Qactual = $AV = 0.0 \text{Im}^3/S$	= 1.99m/s
Qactual - Co Az 2 2AP Qactual - Co Az P(1-184)	
0.01=0.612 XTI (0.024)2 2AP => AP=35.5 KI	Par
·	4TT terms!
$2(b)$ W= $f(d, \lambda, \omega, V, P, M)$	$ \pi_1: W, \pi_2: \mathcal{L} $ H $\pi_3: V, \pi_4: \mathcal{M}$
	H TI3: V, TI4:/1
$T_1 = W(p)^a(d)^b(w)^c$ $= \frac{kg m^2}{S^2} \left(\frac{kg}{m^3}\right)^a(m)^b \left(\frac{1}{S}\right)^c$ $= \frac{kg m^2}{S^2} \left(\frac{kg}{m^3}\right)^a(m)^b \left(\frac{1}{S}\right)^c$ SI unit	$\frac{\sqrt{\frac{kq}{m^2}}}{\sqrt{\frac{m^2}{S^2}}} \left(\frac{m^2}{S^2}\right) \left(\frac{m^2}{S}\right)$ $\frac{\sqrt{\frac{kq}{m^2}}}{\sqrt{\frac{kq}{S^2}}} \left(\frac{m^2}{S^2}\right) \left(\frac{m^2}{S^2}\right)$
$=\frac{k9 \text{ m}}{S^{3}} \left(\frac{k9}{\text{m}^{3}}\right) \left(\frac{1}{S}\right)$	ka m²
ka:1+a=0=)a=-1 for each them!	- Ly 111
$kg:1+a=0 \Rightarrow a=-1$ for each $m:2-3a+b=0 \Rightarrow b=-5$	$ \frac{M - kgm(s) - kg}{s^2 (m^2) - ms} $ $ \omega = \frac{1}{s} $
S:-3-C=0=)C=-3	52 m2 ms
T - W	(e)= 5
$T_1 = p(\omega^3 d)^3$ $T_2 = l(p)^{\alpha}(d)^{\beta}(\omega)^{c} = -l & d have the same parameter T_3 = l(p)^{\alpha}(d)^{\beta}(\omega)^{c} = -l & d have the same parameter T_3 = l(p)^{\alpha}(d)^{\beta}(\omega)^{c} = -l & d have the same parameter T_3 = l(p)^{\alpha}(d)^{\beta}(\omega)^{c} = -l & d have the same parameter $	696/ 500
The = 1(0)a(d)b(w) = -1 & d have the same parameter	er L
$T_2 = l(p)^a(d)^b(w)^c = -l & d have the same parameter = (m(\frac{kq}{m^3})^a(m)^b(\frac{l}{s})^c-just straight away write T_2 =$	d
kg: Ω=0 S:C=0	
s:c=0 m:1-3a+b=0=>b=-1	
•	
$T_2 = \frac{\lambda}{d}$	
	FALCON



	$\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{avg} = 0.5 m/s}$ $\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{c} = \frac{1}{2} V_{c}(laminar flow)}$ $\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{c} = \frac{1}{2} V_{c}(laminar flow)}$ $\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{c} = \frac{1}{2} V_{c}(laminar flow)}$ $\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{c} = \frac{1}{2} V_{c}(laminar flow)}$ $\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{c} = \frac{1}{2} V_{c}(laminar flow)}$ $\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{c} = \frac{1}{2} V_{c}(laminar flow)}$ $\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{c} = \frac{1}{2} V_{c}(laminar flow)}$ $\frac{V_{avg} = \frac{1}{2} V_{c}(laminar flow)}{V_{c} = \frac{1}{2} V_{c}(laminar flow)}$	
3(0) V	$ c = m s \Rightarrow V_{avg} = 0.5 m s $ $ c = m s \Rightarrow V_{avg} = 0.5 m s $ $ c = PVd = 200 \times 0.5 \times 0.1 = 600 (aminar)$ $ c = PVd = 200 \times 0.5 \times 0.1 = 600 (aminar)$ $ c = PVd = aminar $ $ c = PVd = PVd $ $ c = PVd $ $ c = PVd = PVd $ $ c = PVd $	1
R	$e = \frac{PVd}{M} = \frac{1200 \times 0.5 \times 0.1}{100 \times 0.5 \times 0.1} = 600 \text{ (laminar)}$ for travelling m	<u>)</u>
	W 0.1 - 800 (IMMINUT)	10
2.	since laminar flow frm (lest to right dir of flow impt!	
\	Since laminar flow frm (left to right) dir of flow impt! $V = \frac{\Delta PD^2}{32ML} & \Delta P, L \text{ is unknown!}$	
P	P,+Peg(0.2+2)-Peg(0.2)-Peg(x)=P2 Pe=1200 & Pf=1600	
P	P1-P2=(Pf-Pe)0.2g = 400(0.2)(9.81)=784.8Pa	
	$P_1 + P_1 q (0.2 + 2) - P_1 q (0.2) - P_2 q (x) = P_2$ $P_2 = (P_1 - P_1) 0.2 q = 400 (0.2) (9.81) = 784.8 Pa$ $1 - \frac{\Delta PD^2}{32MV} - \frac{784.8 \times 0.1^2}{32(0+7)(0.5)} = 4.905 m$	
6	Slow is frictionless	
1	Pin AP => 1 & , if flow is inviscid, there is no viscosity & thus no friction	
h	Nin $\Delta P \Rightarrow 1$, if flow is inviscid, there is no viscosity & thus no friction 1 to 0 & $1 \to \infty$ since there's no pressure change	
	2=AV & dir flow is frm A→B	
-	•	
	$\sqrt{-\frac{0.02\pi}{2000}} = 2m/s$ & Re = $\frac{PVd}{M} = \frac{1000 \times 2 \times 0.2}{0.001} = 400000 (turbulent)$	
	f= 0.316 (40000)) ²⁵ = 0.0323 0.012565	
F	$\frac{P_{0} + V_{0}^{2}}{p_{0}^{2}} + \frac{1}{A} + H_{p} - h_{L} - \frac{P_{B}}{p_{0}^{2}} + \frac{V_{0}^{2}}{2g} + \frac{1}{Z_{B}} =) H_{p} = h_{L}$ $h_{L} - \left(f_{1} \frac{l_{1}}{d_{1}} + f_{1} + f_{2} \frac{V^{2}}{2g} + \left(f_{2} \frac{l_{2}}{d_{2}} + f_{2} + f_{1} + f_{2} \frac{V^{2}}{2g} + f_{2} + f$	
0 1	V^2	
()	h_=(fidi+Zhi)2g+(f2d2+Zhi2)2g	
_	$-\frac{(0.0126(50) + 2 + \frac{0.0126(400)}{0.2} + 5)}{0.2} + \frac{2^{20}}{19.62} = 7.19 \text{ M}$	
	$7.19=K-2000(0.02T)^2 = K=15.1$	
	1.19=K-2000(0.0211) -/K-13.14	
603/45		ALCON

		1000		Date No.	
		1044 272 2 2 2 2	7,460	Vestule student	1
	BEVA		- 1-0x2-	12 PVL 1200'YO	
+ X (LOV)	79/109	The state of		10 M	
		the right	1 0.7	of Mount ons	
	Ц		* exit	192	
	Hp	Trybu y Mari	101 1 1 7 1 1	14.15	
0121	Paston & ha	4-1012	Fij (FO) P	1-134201 F194+17	
enura		2)(9-81)=184-810	0)004= 81	R-12=17:-12:00	
enurg 10SS X	~ cavitation	50 S 61	N BOXX	1481-184 -1	
	cavitation may appear	no pump & inviscid slow	- 1- 0VP	sise vale n	
		/ inviscid flow	11/4/2003	1 2 2 1 1	
		to occur at the pl flow => no flow is elevations at A & F			
	pump & inviscid I pressures @ &	Slow =) no Slow is elevations at A & E			
		Slow =) no Slow is elevations at A & B			
	pump & inviscid I pressures @ &	Slow =) no Slow is elevations at A & E			
	pump & inviscid I pressures @ &	Slow =) no Slow is elevations at A & B			
	pump & inviscid I pressures @ &	Slow =) no Slow is elevations at A & B			
	pump & inviscid I pressures @ &	Slow =) no Slow is elevations at A & B			
	pump & inviscid I pressures @ &	Slow =) no Slow is elevations at A & B			
	pump & inviscid I pressures @ &	Slow =) no Slow is elevations at A & B			
	pump & inviscid I pressures @ &	Slow =) no Slow is elevations at A & B			

	Z2-Z1 2 head loss	
4(a)(i)	System chara dd=60+500Q2 difference in elevation =60m	No.
. 12	difference in elevation = 60m	
4(a)(ii)	$40=2000 \times \frac{2\pi}{60} = 209.44 \text{ rad/s}$	
1.5	00-2000 x = 209.44 rad/s	
A. Lea	Hp= E= 100-62502-(0150002 20-01500 3/2	
	$H_p = E \Rightarrow 100 - 625Q^2 = 60 + 500Q^2 \Rightarrow Q = 0.1886m^3/s$ $H_p = 100 - 625(0.1886)^2 = 77.78m$	
	NI 200.44 [0.1886] = 11.18m	
	$N_s = \frac{209.44 \int 0.1886}{(9.81 \times 77.78)^{3/4}} = 0.626 \text{ (radial flow)}$	Film All M
4(a)	11) 1 = 600(0.1006) -2756(0.1006) 3- 00 00/	
	Flour (pump) = 20 (0.1886) = 88.076	14626
	Flow (pump) = pg QHp = 9810(0.1886)3= 88.0% They - 143.9 - 163 5 kW	4.14 (1934)
	Input = 143.9 = 163.5 kW	
	power 0.98	TELL WILL
Asov:	2 mars in 1/2 a lacours Q all	
-jw/,iv	2 pumps in 11 - 1 Of becomes 2 & premains the same	\$4T
	2 pumps in $ \Rightarrow Q$ becomes $\frac{Q}{2}$ & Hp temoths the same $60+500Q^2=100-625(\frac{Q}{2})^2$ $656\cdot25Q^2=40=)Q=0.2469m^3/s$ $H_p=100-\frac{625}{4}(0.2469)^2=90.48m$ $Power Pump flow = 9810(0.2469)(90.48)=219.14kW$ $\Lambda=600(0.2469)-3750(0.2469)^3=91.7\%$	and I have
	636.23Q -40 =) (X= 0.1469m ⁷ /s	
	Pp-100-48M	01-10-10
	Fower Pump +10W = 4810(0.2469)(90.48) = 219.14kW	
	76-60010.2469)-3750 (0.2469)3=91.7%	882 / 1
0-	Input - 219.14 = 239.0kW	
	power 0.917 2210KVV	
		FΔLC

4(b)	NPSHR=NPSHA (minimum)	Pt 1: @ atmosphere
	$0 \rightarrow 0$	Pts2: @ Pt b4 the pum
	$\frac{P_1 - P_V}{P_0} + \frac{V_1^2}{20} + \frac{7}{10} + \frac{P_1 - P_V}{P_0} + \frac{V_1^2}{20} + \frac{7}{20} + \frac{7}{$	
	pg 120 1/1 NL pg 120 125	2 187
	105-2340 13183 2 5-7	V= 0+ = 0-0318m/s
	9810 19.62 2-3-25	V- TT(0.1)2 - 0.031011/1)
	Zs=3.947m	11-0/200 - COI = 6H
	:. Max height of pump = 3.47m	22. OLHANDS A
	$5 - \frac{P_s - 2340}{9810} + \frac{3.183^2}{19.62} = P_s = 46.3 \text{kPa}$	746-1-A16-W
	3- 9810 + 19.62 =) 15-46-3KPA	
	:. Min pressure at pump inlet = 46.3 kPa	Designation of
	new Zs=1.6M	TOTAL
	$\frac{Patm - P_{Y} + V_{1}^{2}}{Pq} = 2 - 1 - 6 = 5 = \frac{Patm - 2340}{9810} = 8$ $\frac{Patm = 81640 Pa}{Patm} = \frac{81.6 kPa}{75.2586}$	2 -02/
	pg 129-2-1-6-5-) 9810 -8	-0836
	Patm= 81640 Pa = 81.6 kPa	1=2000a03
	81-64=100[1-(0.0065)Z]5-2586	(= 0.0 = 1.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
	1- (0.0065) Z= 0.962 => Z= 16874 1680M	- 100 - 411 - 100 - 411
	1 (288 /2 0 102 / 2 1924 1000 1	-1/1/2 (000/03/24/1-
		THE NOT
	 	