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[*University of Choice*]

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

[MMUST]

MAIN EXAMINATION

2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN MECHANICAL AND INDUSTRIAL ENGINEERING

COURSE CODE: **MIE 232**

COURSE TITLE: **FLUID MECHANICS II**

DATE: 21-04-2022 **TIME: 12:00-14:00**

INSTRUCTIONS TO CANDIDATES

1. This paper consists of **FOUR** questions
2. Answer Question **ONE [Compulsory]** and any other **TWO** Questions
3. All symbols have their usual meaning

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over

b] A Pelton wheel is to be selected to drive a generator at 550 rpm. The water jet is 70 mm in diameter and has a velocity of 102 m/s. The blade angle is 165° and the ratio of vane speed to initial jet speed is 0.45. Determine the: (i) diameter of the wheel to the centerline of the buckets(vanes) (ii) power developed **[8 marks]**

c] Briefly discuss the conservation of momentum principle. What can you say about the momentum of a body if the net force acting on it is zero **[4 marks]**

.....The End.....

General information

Standard acceleration: g= 9.81 m/s^2 *Standard atmospheric pressure*: 1 atm=101.325 kPa= 760 mmHg=10.33 mH_2O

1 bar=**10^5** Pa

Specific gas constant of air: R= 0.287 kJ/kg. K

Universal gas constant: R_U = 8.314 kJ/kmol K

Dynamic viscosity μ: **1** kgm^{-1}s^{-1} = **1** N s m^{-2} = **1** Pa.s

Kinematic viscosity: m^{-2} /s

MEMORY AIDE

Cross sectional area of number of bars (mm²) - FOR BEAMS

Bar Size (mm)	Number of Bars											
	1	2	3	4	5	6	7	8	9	10	11	12
6	28	57	85	113	141	170	198	226	254	283	311	339
8	50	101	151	201	251	302	352	402	452	503	553	603
10	79	157	236	314	393	471	550	628	707	785	864	942
12	113	226	339	452	565	679	792	905	1018	1131	1244	1357
16	201	402	603	804	1005	1206	1407	1608	1810	2011	2212	2413
20	314	628	942	1257	1571	1885	2199	2513	2827	3142	3456	3770
25	491	982	1473	1963	2454	2945	3436	3927	4418	4909	5400	5890

Cross sectional area of bars per metre (mm²/m) - FOR SLABS

Bar Size (mm)	Bar Spacing (mm)											
	50	75	100	125	150	175	200	225	250	275	300	400
6	565	377	283	226	188	162	141	126	113	103	94	71
8	1005	670	503	402	335	287	251	223	201	183	168	126
10	1571	1047	785	628	524	449	393	349	314	286	262	196
12	2262	1508	1131	905	754	646	565	503	452	411	377	283
16	4021	2681	2011	1608	1340	1149	1005	894	804	731	670	503

Link reinforcement in beams, $\frac{A_{sv}}{sv}$ (mm²/mm) - <u>TWO (2) legs</u> - FOR SHEAR IN BEAMS

Bar Size (mm)	Spacing of Links (mm)											
	50	75	100	125	150	175	200	225	250	275	300	400
6	1.13	0.75	0.57	0.45	0.38	0.32	0.28	0.25	0.23	0.21	0.19	0.14
8	2.01	1.34	1.01	0.80	0.67	0.57	0.50	0.45	0.40	0.37	0.34	0.25
10	3.14	2.09	1.57	1.26	1.05	0.90	0.79	0.70	0.63	0.57	0.52	0.39

Link reinforcement in beams, $\frac{A_{sv}}{sv}$ (mm²/mm) - <u>THREE (3) legs</u> - FOR SHEAR IN BEAMS

Bar Size (mm)	Spacing of Links (mm)											
	50	75	100	125	150	175	200	225	250	275	300	400
6	1.70	1.13	0.85	0.68	0.57	0.48	0.42	0.38	0.34	0.31	0.28	0.21
8	3.02	2.01	1.51	1.21	1.01	0.86	0.75	0.67	0.60	0.55	0.50	0.38
10	4.71	3.14	2.36	1.88	1.57	1.35	1.18	1.05	0.94	0.86	0.79	0.59
12	6.79	4.52	3.39	2.71	2.26	1.94	1.70	1.51	1.36	1.23	1.13	0.85
16	12.06	8.04	6.03	4.83	4.02	3.45	3.02	2.68	2.41	2.19	2.01	1.51