

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code: PC-AUE 402/PC-ME402 Fluid Mechanics & Fluid Machines UPID: 004422

Time Allotted: 3 Hours Full Marks:70

The Figures in the margin indicate full marks.

		Candidate are required to give their answers in their own words as far as practicable				
		Group-A (Very Short Answer Type Question)				
1. Answer any ten of the following : $[1 \times 10 = 10]$						
		What is the dimension of torque?	•			
	(11)	Define hydraulic efficiency of a hydraulic turbine.				
	(111)	What is surge tank?				
	(IV)	What is fluids?				
	(V)	What is minor energy losses in pipes flow ?				
	(VI)	What is dimension of power?				
	(VII)					
	(VIII)	What is the dimension of surface tension?				
	(IX)	Explain impulse turbine.				
	(X)	What are the main parts of centrifugal pump?				
	(XI)	What is kinetic head?				
	(XII)	what is critical Depth (h_c) for flow in open cannels?				
	Group-B (Short Answer Type Question)					
		Answer any three of the following:	5 x 3 = 15]			
2.	mea	er is flowing through a pipe of diameter 5 cm under a pressure of 29.43 N/cm ² (gauge) and with in velocity of 2.0 m/s. Find the total head or total energy per unit weight of the water at a cross ion, which is 5 m above the datum line.	[5]			
3.	State	e Bernoulli's theorem for steady flow of an incompressible fluid with assumtions.	[5]			
4.	Find	the kinematic viscosity of an oil having density 981 kg/m ³ . The shear stress at a point in the oil is	[5]			
		52 N/m ² and velocity gradient at that point is 0.2 per second.				
5.	the l	il of sp. Gr. 0.7 is flowing through a pipe of diameter 300 mm at the rate of 500 litres per second. Find head loss due to friction and power required to maintain the flow for a length of 1000m. Take, $f = co$ ient of friction =0.0048.	[5]			
6.	1.2 r	plan turbine delivers 10 MW under a head of 25 m. The hub and tip diameters are m and 3 m. Hydraulic and overall efficiencies are 0.90 and 0.85. If both velocity triangles are right ed triangles, determine the speed, guide blade outlet angle and blade outlet angle.	[5]			
		Group-C (Long Answer Type Question)				
		Answer any three of the following:	15 x 3 = 45]			
7.	,	A plate having an area of 0.6 m2 is sliding down the inclined plate at 300 to the horizontal with a velocity of 0.36 m/s. There is a cushion of fluid 1.8 mm thick between the plane and the plate. Find the viscosity of the fluid if the weight of the plate is 280 N.	[10]			
	(b)	What do you mean by capillarity?	[5]			
8.		The discharge Q through an orifice depends on the pressure P, the density of fluid p and the	[10]			

- diameter of the orifice d.
 - Determine a general formula for the discharge using Bucking Ham π -theorem.
 - (b) What do you mean by Dimensional Homogeneity? [5]
- 9. (a) The space between two square flat parallel plates is filled with oil. Each side of the plate is 720 mm. [10] The thickness of the oil film is 15 mm. The upper plate, which moves at 3 m/s requires a force of 120 N to maintain the speed. Determine
 - (i) The dynamic viscosity of the oil
 - (ii) The kinematic viscosity of oil if the specific gravity of oil is 0.95

(b)	Write the unit of Kinematic viscosity and dynamic viscosity.	[5]
10. (a)	Two pipes are connected in parallel between two reservoirs that have difference in levels of 3.5 m. The length, the diameter, and friction factor (4 f) are 2400 m, 1.2 m, and 0.026 for the first pipe and 2400 m, 1 m, and 0.019 for the second pipe. Calculate the total discharge between the two reservoirs	[7]
(b)	A tank transmits 100 L/s of water to point C where the pressure is maintained at 1.5 kg/cm2. The first part AB of the pipeline is 50 cm diameter and 2.5 km long, and the second part BC is 25 cm diameter and 1.5 km long. 63 The friction coefficient is 0.005 and minor losses are ignored. Assuming level at C is (0.0); find the water level (L) in the tank?	[8]
11. (a)	A model for a spillway must be built in a laboratory where the maximum capacity of the pump is 9 m3. The prototype has 300 m3 maximum discharge and 5 m head on the crest. a. Determine the scale ratio for the model? 75 b. Calculate the head on the crest of the model? c. Find the time in model corresponding to 36 hours in prototype? d. Determine the loss of power in prototype corresponding to observed 0.05 HP in model?	[10]
(b)	What do you mean by kinematic and dynamic similarity?	[5]

*** END OF PAPER ***

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