BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE) B.Tech.Sem - IV CIVIL :SUMMER- 2022 SUBJECT: MECHANICS OF FLUID

Time: 10:00 AM-01:00 PM Day: Thursday

Date: 16-06-2022

S-12711-2022 Max. Marks: 60 N.B.: 1) All questions are **COMPULSORY**. 2) Figures to the right indicate FULL marks. Assume suitable data if necessary. 3) Non-programmable **CALCULTOR** is allowed. 4) A Circular plate of 2.5m diameter is immersed in water vertically such that top (05) Q.1 a) edge of plate is at 1.5m from the water surface. Determine: The total pressure on one face of the plate ii) The position of Centre of pressure What is metacenter and meta centric height? (05)OR The density of a liquid is 350kg/m³, find its specific weight, specific gravity $\mathbf{Q.1}$ a) (05)and specific volume. If kinematic viscosity of liquid is 1.2cm²/sec, obtain its dynamic viscosity. **b)** What is dynamic and kinematic viscosity of fluid? (05)Define the following: i) Rotational flow ii) 3-Dimensional flow Q.2 a) (05)A stream function is given by $\Psi = 3x^2 - y^3$. Determine magnitude of velocity (05)components at the point (2, 1). OR Define: i) Velocity Potential Function O.2 a) ii) Stream Function (05)A 100cm diameter pipe branches in to two 50 cm diameter pipes. If the velocity (05)of flow in 100 cm diameter pipe is 0.35 m/s and velocity in one of the 50 cm diameter pipe is 0.3m/s find the velocity of flow in other pipe. Q.3 a) What is impulse momentum equation? (05)A 0.3m diameter pipe carries water at a velocity of 20.0m/s. At points A and (05)B measurements of pressures and elevations were respectively 350kN/m² and 250kN/m² and 30m and 35.0m. For steady flow, find the loss of head between A and B. OR

- What is Total Energy Line and Hydraulic Grade Line? 0.3 a) (05)
 - A smooth inclined pipe of uniform diameter 300mm, a pressure of 35kPa was observed at section 1-1 which is at elevation of 5m. Section 2-2 which is at elevation of 9m, the pressure is 25kPa and velocity is 0.75m/s. Determine the direction of flow and head loss between the two sections. Take water density $= 998 \text{kg/m}^3$.

Q.4	a)	What is distorted model and undistorted model?	(05)
	b)	Assuming the rate of discharge Q of a centrifugal pump is dependent upon the mass density ρ of fluid, pump speed N (rpm), the diameter of impeller D, the pressure P and the viscosity of fluid μ , head H and Kinematic viscosity of fluid ν . Express the relationship between dependent and independent variables using Buckingham theorem by taking ρ , N, D as repeating variables.	(05)
		OR	
Q.4	a)	Write the significance of following dimensionless parameters: i) Euler Number ii) Mach Number	(05)
	b)	The pressure drop Δp in a pipe of diameter D and length L depends on mass density ρ and viscosity μ of the flowing fluid, mean velocity of flow V, and average height k of roughness projections on the pipe surface. Using Buckingham π theorem obtain an expression for Δp .	(05)
Q.5	a)	What is laminar Sub-layer?	(05)
	b)	A fluid of mass density 1100kg/m³ and viscosity 0.07N-s/m² is flowing at rate of 2.5m³/min. In a circular pipe of diameter 0.5m. Is this flow laminar or turbulent?	(05)
		OR	
Q.5	a)	Describe Reynolds Experiment and discuss conclusion of the experiment.	(05)
	b)	An oil of viscosity 9 poise and specific gravity 0.85 is flowing through a horizontal pipe of 60mm diameter. If pressure drop in 200m length of pipe is 25kN/m², Determine: i) The rate of flow of oil ii) the center line velocity	(05)
Q.6	a)	What are the observations made from Nikuradse's experiment?	(05)
	b)	A pipe of 200mm diameter and 550m length carries water at rate of 0.15m³/sec. Find head loss due to friction and power required to maintain the flow. (Friction factor 0.003)	(05)
		OR	
Q.6	a)	What are characteristics of Turbulent flow?	(05)
	b)	The diameter of a horizontal pipe 450mm is suddenly contracted to 250mm . The rate of flow through pipe is $0.25 \text{m}^3/\text{s}$. Find head loss due to sudden contraction.	(05)
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(05)