Question Paper Code: R18A21CE03

R18

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, December – 2024

FLUID MECHANICS

(CIVIL ENGINEERING)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)

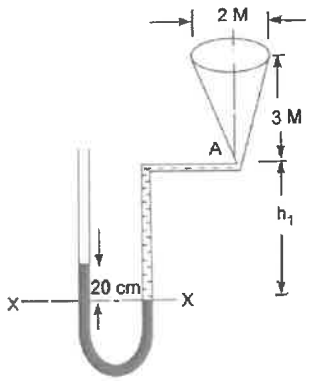
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	How does the viscosity of fluids vary with changes in temperature?	CO1	L1	2M
2.	The pressure intensity at a point in a fluid is given 3.924 N/cm^2. Find the corresponding height of fluid when the fluid is: (a) water, and (b) oil of specific gravity 0.9.	CO1	L1	3M
3.	Explain the conditions of equilibrium of floating and submerged bodies.	CO2	L2	2M
4.	A rectangular sluice gate is situated on the vertical wall of a lock. The vertical side of the sluice is 'd' meters and depth of centroid of the area is 'p' m below the water surface. Determine the depth of centre of pressure.	CO2	L2	3M
5.	Define velocity potential function and stream function.	CO3	L1	2M
6.	Find the force exerted by the flowing fluid on a pipe bend.	CO3	L1	3M
7.	Illustrate the effect of pressure gradient on boundary layer separation.	CO4	L2	2M
8.	Explain Prandtl mixing length theory for turbulent shear stress.	CO4	L1	3M
9.	Explain the terms i) Hydraulic gradient line ii) total energy line.	CO5	L1	2M
10.	How is the velocity of a flowing fluid measured using a Pitot tube?	CO5	L1	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A)	A conical vessel having its outlet at A to which a U-tube manometer is connected. The reading of the manometer given in the figure shows when the vessel is empty. Examine the reading of the manometer when the vessel is completely filled with water.	CO1	L2	10M



OR

B)	Calculate the pressure due to a column of 0.3 of i) water, ii) an oil of specific gravity 0.8, and iii) mercury.	CO1	L2	10M

12. A)	Describe all the components of force exerted on curved surface submerged in a liquid and derive an expression for total hydrostatic pressure.	CO2	L3	10M
	OR			
B)	A circular plate 3m in diameter is immersed in water in such a way that the plane of the plate makes an angle of 60 degrees with the free surface. Determine the total pressure and the position of centre of pressure when the upper edge of the plate is 2m below the free water surface.	CO2	L3	10M
13. A)	Obtain an expression for continuity equation for a three-dimensional flow.	CO3	L3	10M
	OR			
B)	Describe Venturimeter and derive an expression for measuring the discharge of fluid through a pipe with this device.	CO3	L3	10M
14. A)	For the velocity profile for laminar boundary layer flows given as $\frac{u}{U} = 2(\frac{y}{\delta} - (\frac{y}{\delta})^2$ Develop an expression for boundary layer thickness (δ) and shear stress.	CO4	L3	10M
	OR			
B)	A smooth pipe of diameter 80 mm and 800 m long carries water at the rate of 0.480 m3/min. Calculate the loss of head, wall shearing stress, centre line velocity and shear stress at 30 mm from pipe wall. Take kinematics viscosity of water as 0.015 strokes. Take the value of co-efficient of friction 'f' from the relation give as $f = 0.0791/(Re)^{\frac{1}{4}}$ Where, Re – Reynolds no.	CO4	L3	10M
15. A)	A convergent-divergent mouthpiece is fitted to the side of a tank. The discharge through mouthpiece under a constant head of 1.5 m is 5 Liters/s. The head loss in the divergent portion is 0.10 times the kinetic head at outlet. Determine the throat and exit diameters, if separation pressure is 2.5 m and atmospheric pressure head = 10.3 m of water.	CO5	L3	10M
	OR			
B)	A venturimeter is installed in a 300 mm diameter horizontal pipeline. The throat pipe rate is 1/3. Water flows through the installation. The pressure in the pipeline is 13.783 N/cm2 (gauge) and vacuum in the throat is 37.5 cm of mercury. Neglecting head loss in the venturimeter, determine the rate of flow in the pipeline.	CO5	L3	10M