Reg. No. : | | | | | | | | | | | | |

Question Paper Code:R3105

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Civil Engineering

R21UCE 305-FLUID MECHANICS

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

PART A - (5 x 1 = 5Marks)

1. The property of a fluid which determines its resistance to shearing stress is called CO1 -U

   (a) Viscosity (b) Surface tension (c) Compressibility (d) None of the above

2. A venturimeter having a throat diameter of 0.1 m is used to estimate the flow rate of a horizontal pipe having a diameter of 0.2 m. For an observed pressure difference of 2 m of water head and coefficient of discharge equal to unity, assuming that the energy losses are negligible, the flow rate (in m^3/s) through the pipe is approximately equal to CO1 -U

   (a) 0.150 (b) 0.050 (c) 0.150 (d) 0.050

3. Which of the following quantities has the dimensions $[M^0 L^0 T^0]$ CO1 -U

   (a) Stress (b) Strain (c) Strain Rate (d) Density

4. A 2 km long pipe of 0.2 m diameter connects two reservoirs. The difference between water levels in the reservoirs is 8 m. The Darcy-Weisbach friction factor of the pipe is 0.04. Accounting for frictional, entry and exit losses, the velocity in the pipe (in m/s) is CO2 -App

   (a) 0.63 (b) 0.35 (c) 2.52 (d) 1.25

5. The region between the separation streamline and the boundarysurface of the solid body is known as CO1 -U

   (a) wake (b) drag (c) lift (d) boundary layer

PART – B (5 x 3= 15Marks)

6. Write short notes on Total Pressure and Centre of Pressure. CO1- U

7.		What is venturimeter? Write the main parts of Venturimeter.	CO1- U	
8.		List out the advantages of model analysis.	CO1- U	
9.		What is major loss in a pipe	CO1- U	
10.		Write Von Karman's momentum integral equation for boundary layer flow.	CO1- U	

PART – C (5 x 16= 80Marks)

11.	(a)	Calculate the capillary effect in millimeters a glass tube of 4 mm diameter, when immersed in a) water b) mercury. The temperature of the liquid is 20° C and the values of the surface tension of water and mercury at 20° C in contact with air are 0.073575 and 0.51 N/m respectively. The angle of contact for water is zero that for mercury 130°. Take specific weight of water as 998 kg/m^3	CO2 - App	(16)
		Or		
	(b)	If the velocity distribution over a plate is given by u= 2/3y-y^2 in which u is the velocity in metre per second at a distance y metre above the plate, determine the shear stress at y=0 and y=0.15 m.Take dynamic viscosity of fluid as 8.63 poise	CO2 - App	(16)
12.	(a)	If for a two – dimensional potential flow, the velocity potential is given by ϕ = x (2y −1) determine the velocity at the point P(4,5). Determine also the value of stream function Ψ at the point P.	CO2 - App	(16)
		Or		
	(b)	A 40 cm diameter pipe conveying water branches into two pipes of diameters 30 cm and 25 cm respectively. if the average velocity in the 40 cm diameter pipe is 2.5m/find the discharge in this pipe and also the velocity in 25 cm pipe .if the average velocity in 30 cm diameter pipe is 4m/s	CO2 - App	(16)
13.	(a)	(i) Explain in detail about types of forces acting in moving fluids (ii) Write short notes on Dimensionless numbers and its types	CO1- U	(8+8)
		Or		
	(b)	Discuss about Buckingham's π theorem. State the procedure for solving problems.	CO1- U	(16)
14.	(a)	A crude oil of kinematic viscosity 0.4 stoke is flowing through a pipe of diameter 300mm at the rate of 300 liters per sec. Find the head lost due to friction for a length of 50m of the pipe	CO2 - App	(16)
		Or		

	(b)	A sudden enlargement of a water main from 240mm to 480mm diameter ,The hydraulic gradient by 10mm.Estimate the rate of flow.	CO2 - App	(16)
15.	(a)	A flat plate 1.5m X 1.5m moves at 50km/hr in stationary air of density 1.15kg/m^3 .If the coefficient of drag and life are 0.15 and 0.75 respectively. Determine the lift force, drag force ,resultant force and the power required to keep the plate in motion	CO2 - App	(16)
		Or		
	(b)	Calculate the total drag on one side of a smooth plate with a length of 5 m and a width of 2.5 m, when the plate is moving at a velocity of 6 m/s in stationary air. Determine the drag assuming: (i) the boundary layer is laminar over the entire length of the plate, and (ii) the boundary layer is turbulent from the very beginning. Use a kinematic viscosity of =3.5 X 10^{-5} m^2/s, and an air density of 2.226 kg/m^3.	CO2 - App	(16)

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