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

Question Paper Code: U3105

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

Third Semester

Civil Engineering

21UCE305 - FLUID MECHANICS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The ratio of the specific weight of the liquid to the specific weight of the standard fluid is known as CO1- U

   (a) Specific volume (b) Weight density (c) Specific gravity (d) Viscosity

2. Bernoulli's theorem deals with the law of conservation of CO1- U

   (a) Mass (b) Momentum (c) Energy (d) None of the above

3. What are the dimensions of force? CO1- U

   (a) $[M\ L\ T^{-2}]$ (b) $[M\ L\ T^{-1}]$ (c) $[M\ L^{2}\ T^{-2}]$ (d) $[M\ L^{2}\ T^{2}]$

4. A liquid flows through pipes 1 and 2 with the same flow velocity. If the ratio of their pipe diameters d1 : d2 be 3:2, what will be the ratio of the head loss in the two pipes? CO2- App

   (a) 3:2 (b) 9:4 (c) 2:3 (d) 4:9

5. The thickness of laminar boundary layer at a distance 'X' from the leading edge over a flat varies as CO1- U

   (a) X (b) $X^{1/2}$ (c) $X^{1/5}$ (d) $X^{4/5}$

PART – B (5 x 3= 15 Marks)

6. State Pascal's Law. CO1- U

7. What is venturimeter? Write the main parts of Venturimeter. CO2- App

8. State Buckingham's πtheorem. CO3- App

9. Define critical velocity CO4- App

10. What are the different methods of preventing the separation of boundary layers? CO6- App

PART – C (5 x 16= 80Marks)

11. (a) The dynamic viscosity of oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5 mm CO1- U (16)

Or

(b) 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 CO1- U (16)

12. (a) Briefly describe about velocity potential function and stream function and its relations CO2- App (16)

Or

(b) A 30cm diameter pipe conveying water branches into two pipes of diameters 20cm and 15 cm respectively. if the average velocity in the 30cm diameter pipe is 2.5m/s.Find the discharge in the pipe, also determine the velocity in 15cm pipe .if the average velocity in 20cm diameter pipe is 2m/s CO2- App (16)

13. (a) Discuss about Buckingham's π theorem. State the procedure for solving problems. CO3- App (16)

Or

(b) Using Buckingham's π theorem, show that the velocity through a circular orifice is given by $v = \sqrt{2gH}\left[\frac{D}{H}, \frac{\mu}{\rho v H}\right]$, where H is the head causing flow, D is the diameter of the orifice, μ is the coefficient of viscosity, ρ is the mass density and g is the acceleration due to gravity. CO3- App (16)

14. (a) Examine the head lost due to friction in a pipe of diameter 300mm and length 50m, through which water is flowing at a velocity of 3m/s using (i) Darcy formula, (ii) Chezy"s formula for which C = 60 CO2- App (16)

Or

	(b)	The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170m, 210m and of diameters 300mm, 200mm and 400 mm respectively, is 12m. Determine the rate of flow of water if coefficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering minor losses also.	CO2- App	(16)
15.	(a)	Explain in detail about the boundary layer separation	CO1- U	(16)

Or

	(b)	Determine the thickness of the boundary layer at the tailing edge of smooth plate of length 4 m and of width 1.5 m ,when the plate is moving with a velocity of 4 m/s in stationary air. Take kinematic viscosity =1.5 X 10^{-5} m^2/s	CO2- App	(16)