B.Tech. SEM -IV (Civil) 2014 Course (CBCS) : WINTER - 2017

SUBJECT: MECHANICS OF FLUIDS

Day : **Wednesday**
Date : **22/11/2017**

Time: **02.30 PM TO 05.30 PM**
Max. Marks: 60

W-2017-2070

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if **NECESSARY**.

Q.1 **a)** What is dynamic and kinematic viscosity of fluids? **(05)**

b) A 5 m^3 of certain oil weights 45 N. Calculate Specific Weight, Mass density, and Specific gravity of oil. **(05)**

OR

a) What is stable, unstable and neutral equilibrium in case of floating bodies? **(05)**

b) A plate is having an area of 0.5 m^2 is sliding down the inclined plane at 30^0 with a velocity of 0.20 m/s. There is a cushion of oil 1 mm thick between plate and plane. Find viscosity of oil if weight of plate is 250N. **(05)**

Q.2 **a)** Define i) Steady & Unsteady Flow ii) Uniform & Non Uniform Flow. **(05)**

b) A stream function is given by, $\psi = 3x^2 - y^3$. Determine the magnitude of velocity components at the point (2,1) **(05)**

OR

a) What is one dimensional (1-D), two dimensional (2-D) and three dimensional (3-D) flow. **(05)**

b) The diameter of pipe at section 1-1 and 2-2 are 200 mm and 240 mm. If velocity of water flowing through pipe at section 1-1 is 1.5 m/s.
Find i) The discharge through the pipe ii) The velocity at section 2-2. **(05)**

Q.3 **a)** State and explain Bernoulli's theorem for ideal and real fluids. **(05)**

b) Water is flowing through an inclined pipe line having diameter 500 mm and 200 mm at bottom and upper end respectively. The intensity of pressure at bottom end is 250 kN/m^2 and pressure at upper end is 150 kN/m^2. Determine the difference in elevation of upper and bottom end. The rate of flow through this pipe is 0.05m^3/sec. **(05)**

OR

a) What are assumptions made in derivation of Bernoulli's theorem? **(05)**

b) At a section 1-1 in horizontal pipe the diameter is 6cm and pressure is 100 KN/m^2. At another Section 2-2, the diameter is 10 cm and pressure is 120 KN/m^2. If the discharge is 0.09m^3/sec, determine the direction of flow. **(05)**

Q.4 **a)** What is dimensional homogeneity of an equation? **(05)**

b) The pressure drop Δp in a pipeline of diameter D and length L depends upon density ρ ,viscosity μ of the flowing fluid , mean velocity V and average height of roughness projections k. Obtain an expression for Δp **(05)**

OR

a) What are distorted and undistorted models? **(05)**

b) The discharge Q of a centrifugal pump depends upon mass density of fluids (ρ), the speed of the pump (N), the diameter of the impeller (D), the Manometric head (H_m) and viscosity of fluid (μ). Express Q in terms of dimensionless parameters. **(05)**

P.T.O.

Q.5 **a)** What is Momentum thickness (θ) and Energy thickness (δ). **(05)**

b) The velocity distribution in the boundary layer, is given by $u/U=y/\delta$, where u is the velocity at a distance y from the plate. Determine **(05)**
i) The displacement thickness. ii) The momentum thickness.

OR

a) What are the characteristics of Laminar flow? **(05)**

b) An oil of viscosity 9 poise and specific gravity 0.9 is flowing through a horizontal pipe of 50 mm diameter. If pressure drop in 200 m length of pipe is 20 kN/m^2. **(05)**
Determine i) The rate of flow of oil ii) The center line velocity.

Q.6 **a)** What are the characteristics of Turbulent flow? **(05)**

b) The diameter of a horizontal pipe enlarges from 350 mm to 650 mm. The rate of flow of water through the pipe is 0.45 m^3/sec. If intensity of pressure in the smaller pipe is 100 kN/m^2, **(05)**
Determine i) The loss of head due to sudden enlargement. ii) Intensity of pressure in larger pipe.

OR

a) What are the observations made from Nikuradse's Experiment? **(05)**

b) A compound piping system consist of 1800 m length of 50 cm diameter, 1200 m length of 40 cm diameter and 600 m length of 30 cm diameter pipes of same material, connected in series. What is the equivalent length of 40 cm diameter pipe of same material? **(05)**

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