B.Tech. SEM -IV (Civil) 2014 Course (CBCS) : SUMMER - 2019
SUBJECT: MECHANICS OF FLUIDS

Day: Tuesday
Date: 28/05/2019

Time: 10.00 AM TO 01.00 PM
Max. Marks: 60

S-2019-2599

N.B.:

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagrams **WHEREVER** necessary.

Q.1 a) Enlist and explain any three important physical properties of fluids. **(05)**

b) A plate having an area of $0.6m^2$ is sliding down the inclined plane at 30^0 horizontal with velocity of 0.4m/s. There is a film of fluid 2mm thick between plate and plane. Find viscosity of fluid if weight of plate is 600N. **(05)**

OR

Q.1 a) Explain with figure experimental determination of meta centric height. **(05)**

b) Explain classification of fluids. **(05)**

Q.2 a) What is uniform and non-uniform type of flow? **(05)**

b) The velocity potential function for 2D flow is $\phi = x(xy-1)$. At a point (4,5) determine the velocity and value of Stream Function. **(05)**

OR

Q.2 a) Define Velocity Potential Function and Stream Function. **(05)**

b) The diameter of a pipe at section 1-1 and 2-2 are 300mm and 200mm respectively. If velocity of water flowing through pipe at section 1-1 is 0.5m/s. Find **(05)**

i) Discharge through pipe ii) Velocity at section 2-2.

Q.3 a) What is Hydraulic Gradient Line and Total Energy Line. **(05)**

b) Water is flowing through a circular pipe. At one section the diameter is 0.10m and pressure is 200Kpa and the average velocity of flow is 1m/s and elevation is 2m above the datum. The elevation at section 2 is 1.5 m and pipe diameter is 0.15m. Find pressure at section 2 ρ_w=1000kg/m^3 **(05)**

OR

Q.3 a) State Bernoulli's theorem with significance of various terms in it. **(05)**

b) A pipe line carrying water has diameter of 200mm at section 1 and pressure 100 kN/m^2. At section 2 which is 2.5 higher than section 1, the diameter is 400 mm and pressure is 50kN/m^2. The pipe carries a discharge of 0.25m^3/sec. Determine: **(05)**

i) Loss of head ii) Direction of flow.

P. T. O.

Q.4 a) Explain Dimensional Homogeneity with suitable examples. (05)

b) Derive suitable expression for the thrust developed by propeller. The thrust depends on angular velocity ω, speed and advance v, diameter D, dynamic viscosity μ Mass density ρ And elasticity of fluid medium which can be denoted by speed of sound in the medium C. (05)

OR

Q.4 a) State the explain Buckingham's π theorem. (05)

b) The resisting force F on the airplane depends upon length of aircraft L, velocity v, air viscosity μ, air density ρ and bulk modulus of air K. Express functional relationship between these variables and resisting force using π method. (05)

Q.5 a) What is laminar sublayer? (05)

b) Derive Hagen Poiseulli law. (05)

OR

Q.5 a) What is displacement thickness (δ^*) and momentum thickness (θ). (05)

b) A fluid of density 900kg/m^3 and viscosity 0.05 N.s/m^2 is flowing through circular pipe of area 1m^2 at the rate of 3m^3/min. Is this flow laminar or turbulent? (05)

Q.6 a) What is instantaneous velocity and temporal mean velocity? (05)

b) The diameter of horizontal pipe, which is 200 mm suddenly changes to 100 mm diameter. The rate of flow thorough pipe is 0.25m^3/sec. Find loss of head due to sudden change in diameter. (05)

OR

Q.6 a) What is Prandtl's mixing length theory? (05)

b) The diameter of horizontal pipe, which is 300mm suddenly changes to 450 mm diameter. The rate of flow thorough pipe is 0.3m^3/sec. Find loss of head due to sudden change in diameter. (05)

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