Total No of Questions: [8]   **SEAT NO. :**

SE Civil(2012 Course)
Fluid Mechanics-I

Time: 2 Hours   **Max. Marks : 50**

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q6 or Q7, Q7 or Q8.*
2) *Answers to the all questions should be written in single answer-book.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator (non programmable) and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

Q1) a) Explain "Capillarity" with neat sketch. Derive the expression for capillary rise with usual notations. [6]

   b) An inverted differential manometer containing an oil of specific gravity 0.9 is connected to find the difference of pressure at two points of pipe containing water. If the manometer reading is 42 cm. Find the difference of pressure [6]

OR

Q2) a) i) A ship model of scale 1/60 is towed through sea water at a speed of 1.1 m/s. A force of 2.1 N is required to tow the model. Determine the speed of ship and the propulsive force on the ship, if the prototype is subjected to wave resistance only. [3]

   ii) In the model test of spillway the discharge and velocity of flow over the model were   2.1m³/s and 1.6 m/s respectively. Calculate the velocity and discharge over the prototype which is 40 times the model size. [3]

   b) Explain with neat sketches various conditions of equilibrium related to stability of floating body. [6]

Q3) a) Explain in brief the Eulerian and Langrangian method to describe the motion of fluid. [6]

   b) The top and bottom diameters of a 2m long vertical tapering pipe are 100 mm and 50 mm respectively. Water flows down the pipe at 30 litres per second. Find the pressure difference between the two ends of the pipe [6]

OR

Q4) a) Derive equation of continuity for three dimensional flow in Cartesian co-ordinates. [6]

   b) A vertical sharp edged orifice 100 mm diameter discharges 95 lps under head of 9.5 m. A point on the jet has its horizontal and vertical coordinates of 4.6 m and 0.55 m respectively, measured from vena-contracta. Find Cd, Cc and Cv. [6]

Q5) a) i) What are the condition for laminar flow to occur in pipe?State the different characteristics of laminar flow. [4]

   ii)An oil having a viscosity of 10 poise flows through a pipe of 500mm diameter at a rate of 500litre per second .Find the type of flow occurring in the pipe, if the specific gravity of oil is 0.9 [3]

b) Explain the concept of boundary layer and explain with neat sketch the development of boundary layer on flat plate. [6]

OR

Q6) a) Define Displacement thickness and derive the expression for displacement thickness [6]

b) Show that the velocity distribution for an viscous flow in circular pipe is given by $u = u_{max} \left[(1 - (r/R)^2\right]$.Also sketch the velocity and shear stress distribution [7]

Q7) a) i) Explain Prandtl Mixing length theory [3]

ii)Explain with neat sketch the difference between hydro dynamically smooth and rough boundaries [4]

b) Explain the necessity for measuring the viscosity of fluid and what are the different methods adopted for the measurement of viscosity, explain method with neat sketch. [6]

OR

Q8) a) What is equivalent pipe? Derive the Dupit equation for equivalent pipe [6]

b) A pipe of diameter 300mm diameter suddenly converges to 150mm diameter, due to this the pressure changes from 95 kN/m^2 to 50 kN/m^2 ,if co efficient of contraction is 0.65,calculate the flow rate carried by the pipe [7]