

Seat No.	
-------------	--

S.E. (Civil) (Part - I) (Semester - III) Examination, December - 2014
FLUID MECHANICS - I
Sub. Code : 63341

Day and Date : Friday, 12 - 12 - 2014

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :
- 1) Attempt any three questions from each section.
 - 2) Figures to the right indicate full marks.
 - 3) Assume any other suitable data, if required.

SECTION - I

- Q1)** a) Define the following fluid properties and mention their practical evidence: Viscosity, Surface Tension, and Capillarity. [6]
- b) State the minimum diameter of glass tube to be immersed in water, for which capillary effects are to be limited upto 2.98 mm. Take surface tension of water in contact with air as 0.073 N/m. Prove the formula used. [6]
- c) The viscous force ' F_D ' exerted by a fluid on a sphere of dia. ' D ' depends on Viscosity ' μ ', mass density of fluid ' ρ ' and velocity of the sphere ' u '. Perform the dimensional analysis. [6]
- Q2)** a) An annular plate 3m external diameter and 1m internal diameter is immersed in oil of sp. Gravity 0.8, with its greatest and least depths below the oil surface of 3m and 1m respectively. Determine the total pressure and the depth to centre of pressure on one face of the plate. [8]
- b) What are the types of equilibrium and conditions of stability for floating objects? [8]

P.T.O.

- Q3)** a) Write a short note on: Classification of flow. [8]
- b) A stream function is given by, $\psi = 3xy$. Determine whether flow is possible, whether flow is rotational or irrotational, and acceleration at (1, 1). [8]

Q4) Write short notes on:

[4 × 4 = 16]

- a) Newton's law of viscosity.
- b) Velocity and acceleration at a point for 3-D flow.
- c) Resultant hydrostatic forces on a curved surface.
- d) Scale ratios in Reynolds model law.

SECTION - II

- Q5)** a) Derive an expression for Euler's Equation along a streamline and further derive Bernoulli's equation. What are the assumptions made? [8]
- b) A venturimeter 100mm × 50mm size is used to measure the flow of liquid of specific gravity 0.8. If the mercury differential manometer head is 200 mm, Find the discharge through venturimeter. Find also the pressure intensity at throat, if pressure intensity at inlet is 50 KPa. [8]
- Q6)** a) Explain Reynold's Experiment with a sketch. Differentiate laminar flow and turbulent flow w.r.t. losses & velocity distribution. [8]
- b) Find the Displacement thickness, Momentum thickness & Energy thickness for the velocity distribution in the boundary layer given as $u/U = 2(y/\delta) - (y/\delta)^2$. [8]

Q7) a) What are different minor losses in pipe flow? Give their expressions. Explain the major loss also. [6]

b) Two reservoirs connected by a pipeline consisting of two pipes, one of 10 cm dia. and length 2km and the other of dia. 20cm and 2km length. If the difference in water level in the two reservoirs is 10m. Calculate the discharge considering all losses. Take $f = 0.04$ for both the pipes. [6]

c) Explain the phenomenon of water hammer. Give practical examples. [6]

Q8) Write short notes on any Four: [16]

a) Concept of HGL and TEL.

b) Moody's Chart.

c) Hydrodynamically smooth and rough boundaries.

d) Surge Tank.

e) Pipes in series and pipes in parallel.

