S–2003

Seat No.	

Total No. of Pages : 3

S.E. (Civil) (Part -I) (Semester - III) Examination, December - 2015

FLUID MECHANICS - I

Sub. Code : 63341

Day and Date : Monday, 14 - 12 - 2015 **Total Marks : 100**

Time : 10.00 a.m. to 01.00 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) **[3 × 6 = 18]**

a) Explain the property: Vapour pressure. Give its significance in engineering.

b) A metal disc 400mm diameter slides down on inclined plane covered with thin oil film 0.5mm thick. The plane is inclined at 40° with horizontal. Viscosity of oil is 2.449 poise. If the speed of the disc is 0.5m/s, determine weight of disc.

c) Explain in brief the laboratory procedure to determine the metacentric height.

Q2) **[2 × 8 = 16]**

a) A 8 m high closed tank of 2m × 1.5m cross section is filled with water upto a depth of 5m and The remaining space with oil of relative density 0.9; Determine :

i) The pressure at the bottom of the tank

ii) The magnitude and location of the force on the vertical face of 2m side of the tank.

P.T.O.

b) Show by dimensional analysis for a partially submerged body, the drag force is given by $F_D = \rho L^2 V^2 \, \emptyset(\rho VL/\mu, V/\sqrt{g.L})$

Q3) **[2 × 8 = 16]**

a) Derive continuity equation in differential form for a 3-D, steady, incompressible flow.

b) The velocity components in a 2-D irrational flow of an incompressible fluid are :

$u = y^3/3 + 2x - x^2y$ and $v = xy^2 - 2y - x^3/3$; Obtain the expressions for stream function and velocity potential.

Q4) Write short notes on : **[4 × 4 = 16]**

a) Fluid Pressure and its measurement.

b) Froude model law.

c) Classification of flow.

d) Flow net and its properties.

SECTION - II

Q5) a) State and explain Bernoulli's equation for steady, incompressible and inviscide flow. Also explain briefly how do you verify this theorem in laboratory. **[6]**

b) In a vertical pipe conveying oil of specific gravity 0.8, two pressure gauges have been installed at A & B where diameters are 16cm and 8cm respectively. A is 2m above B. Pressure at B is greater than A by 9.81KPa. Neglecting all losses calculate the flow rate. **[6]**

c) A tank containing water is provided with a sharp edged circular orifice of 7.5mm dia. The head above the orifice is 1.44m and centerline of the jet lies at 1.5m away & 0.42m vertically below the venacontracta. The actual discharge through orifice 9LPM , determine the hydraulic coefficients of orifice. **[6]**

Q6) a) Derive Hazen Poisulle's Equation for viscous flow through pipe and further find the expression for Power required to overcome the resistence. **[8]**

b) Find the Displacement thickness, Momentum thickness & Energy thickness for the velocity distribution in the boundary layer given as $u/U = (y/\delta)^{1/7}$. **[8]**

Q7) a) What is the concept of equivalent pipe . Derive Dupit's equation. A piping system consists of three pipes arranged in series, the lengths of pipes are 1.2Km, 0.75Km and 0.6Km and diameters 75cm, 60cm & 45cm respectively. Determine the equivalent diameter of pipe. **[8]**

b) What is siphon? Explain with sketch. Two reservoirs having elevation difference 15m are connected by a 200mm dia. siphon. Length of siphon is 400m out of which 120m is rising limb. Summit is 3m above the upper reservoir level. Determine discharge through siphon and pressure at the summit. Take f = 0.02. Neglect minor losses. **[8]**

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

a) Venturimeter and orificemeter.

b) Time required for emptying the tank fitted with orifice.

c) Separation of Boundary layer and its control.

d) Concept of water hammer.

e) Major and minor losses.

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