Roll No. .....

24066

B. Tech. 3rd Sem.

Civil Engg. (Branch-XI)

Examination – December, 2013

FLUID MECHANICS – I

'F' Scheme

Paper : CE-205-F

Time : Three hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complain in this regard, will be entertained after examination.

Note : Attempt any five full questions choosing at least *one* question from each section.

SECTION – A

1. (a) What is viscosity? Explain Newton's law of viscosity in details. 6

(b) Write short note on different Types of fluids. 6

(c) Derive an equation for the capillary rise of water. in a glass tube immersed in it. 8

2. (a) Differentiate between the Stream function and velocity potential function. 10

(b) The stream function for a two dimensional flow is given by $\psi=2xy$

(i) Calculate the velocity components in x and y directions at a point P(2,3). 4

(ii) Find the velocity potential function ϕ. 6

SECTION – B

3. (a) Explain the following with the help of neat sketches:

(1) Simple manometer 3

(2) U tube manometer 3

(3) Single column manometer 4

(b) Determine the Gauge and absolute pressure at a point which is 2.0 m below the free surface of water. Take atmospheric pressure as 10.1043 N/cm^2. 10

4. Show that a cylindrical buoy of 1 m diameter and 2.0 m height weighing 7.848kN will not float vertically in sea water of density $1030kg/m^3$. Find the force necessary in a vertical chain attached at the centre of base of the buoy that will keep it vertical. 20

SECTION – C

5. (a) Derive Bernoulli's equation for fluid flow from the first principal. 8

(b) A venturimeter has its axis vertical, the inlet and throat diameters being 150 mm and 75 mm respectively. The throat is 225 mm above inlet and coefficient discharge (C_d) = 0.96. Petrol of specific gravity 0.78 flows up through the meter at a rate of 0.029 m^3/s. Find the pressure difference between the inlet and the throat. 12

6. (a) What do you mean by boundary layer separation? What is the effect of pressure gradient on the boundary layer separation? 10

(b) Oil with a free stream velocity of 1.5 m/s flow over a thin plate 1.4m wide and 2.2m long. Calculate the boundary layer thickness and shear stress at the trailing end point and determine the total surface resistance of the plate. Take specific gravity of the oil as 0.80 and kinematic viscosity as 0.1 stoke. 10

SECTION – D

7. (a) State Buckingham's π-theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis? 10

(b) What is meant by geometric, kinematic and dynamic similarities ? Are these similarities truly attainable ? If not why ? 10

8. Explain the various important dimensionless numbers used in model analysis along with their significance.20