FT-228

B.E. IV Semester

Examination, June 2017

Choice Based Credit System (CBCS)

Fluid Mechanics

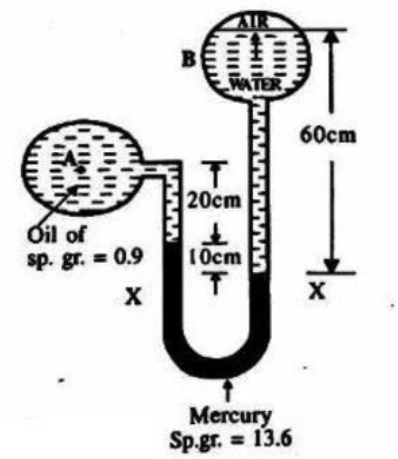
Time : Three Hours] [Maximum Marks : 60

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) Does the viscosity of liquid and gases increase with temperature growth. Suggest reason for the difference in behavior, if any.

b) A differential manometer is connected at the two points A and B as shown in figure. At B air pressure is 9.81N/cm^2 (abs), find the absolute pressure at A.



2. a) What do you mean by rate of flow? Distinguish between laminar and turbulent flow.

b) The stream function for a two dimensional flow is gives by $\psi = 2xy,$ calculate the velocity at the point p(2, Find the velocity potential function ϕ.

3. a) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation from first principle.

b) Find the discharge of water flowing through a pipe 30cm diameter placed in an inclined position where a Venturimeter is inserted, having a throat diameter of 15cm. The difference of pressure between the main and throat is measured by a liquid of gr. 0.6 in an inverted U-tube which gives a reading of 30cm. The loss of head between the main and throat is 0.2 times the kinetic head of the pipe.

4. a) What do you mean by dimensionless numbers? Define any four dimensionless numbers.

b) A partially sub-merged body is towed in water. The resistance R to its motion depends on the density. ρ, the viscosity μ of water, length 1 of the body, velocity v of the body and the acceleration due to gravity g. Show that the resistance to the motion can be expressed in the form.

$R = \rho V^2 L^2 \phi[(\mu / \rho VL).(\lg/V^2)]$

5. a) Describe Reynolds experiments to demonstrate the two types of flow.

b) An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 50mm and of length 300mm. The rate of flow of fluid through the pipe is 3.51it/s. Find the pressure drop in a length of 300m and also the shear stress at the pipe wall.

6. a) Explain the terms:

(i) Dynamic viscosity (ii) Kinematic viscosity

Give their dimensions.

b) Define stream function and velocity potential function.

7. a) Explain the principle of Venturimeter with neat sketch. Derive an expression for the discharge through a Venturimeter.

b) What 'do you mean by repeating variables? How are repeating variables selected for dimensional analysis?

8. a) Prove that for the laminar flow through a circular pipe, the shear stress variation across the section of the pipe is linear and velocity variation is parabolic.

b) A 30cm diameter pipe, conveying, branches into two pipes of diameters 20cm and 15cm respectively. If the average velocity in the 30cm diameter pipe is 2.5m/s, find the discharge in this pipe. Also determine the velocity in 15cm pipe if the average-velocity in 20cm diameter pipe is 2m/s.

****