

GUJARAT TECHNOLOGICAL UNIVERSITY

P.D.D.C Sem-III Examination May 2011

Subject code: X31901**Date: 18/05/2011****Subject Name: Fluid Mechanics****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Derive the expression for the U-tube Differential manometer with neat diagram. **07**

(b) Calculate the pressure due to a column of 0.3 of (a) water, (b) an oil of sp. Gr. 0.8, and (c) mercury of sp. Gr. 13.6. take density of water, $\rho = 1000 \text{ kg/m}^3$. **07**

Q.2 (a) Explain with neat sketches the conditions for equilibrium for floating and submerged bodies. **07**

(b) Describe the phenomenon of capillary and derive an expression for capillary rise of a liquid. **07**

OR

(b) A tank contains water upto a height of 0.5m above the base. An immiscible liquid of sp. Gr. 0.8 is filled on the top of water upto 1m height. Calculate total pressure on one side of the tank. **07**

Q.3 (a) A 30cm diameter pipe, conveying water, branches into 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. **07**

(b) Derive Euler's equation of motion. **07**

OR

Q.3 (a) Water is flowing through a pipe having diameter 300mm and 200mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2 . Determine the difference in datum head if the rate of flow. Through is 40lit/s. **07**

(b) Derive an equation for time of emptying a tank through an orifice at its bottom. **07**

Q.4 (a) Derive an expression for Hagen – Poiseuille's formula for viscous fluid flow through circular pipe. **07**

- (b) Derive an expression Chezy's Formula for loss of head due to friction in pipes. 07

OR

- Q.4** (a) What are the types of minor losses in pipes? Derive any one. 07

- (b) State and explain Buckingham's π – theorem. 07

- Q.5** (a) Derive Bernoulli's energy equation for compressible flow. 07

- (b) Derive an expression for viscous resistance of Journal Bearing. 07

OR

- Q.5** (a) Explain capillary tube method for determination of co-efficient of viscosity. 07

- (b) Explain hydro-dynamically smooth and rough boundaries. 07
