

MODEL QUESTION PAPER Prepared by [ktubtechquestions.com](http://ktubtechquestions.com)

THIRD SEMESTER B.TECH DEGREE EXAMINATION JANUARY 2017

ME 203 MECHANICS OF FLUID

Time: 3 Hrs

Marks:100

**PART A**

( Answer Any Three Questions Each carries 10 marks)

1. Explain the phenomenon of capillarity. Obtain the expression for capillary rise of a liquid.
2. A U tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetra chloride having a specific gravity 1.59 under a pressure of 11.77 N/cm<sup>2</sup> and pipe B contains oil of specific gravity 0.8 under a pressure of 11.77 N/cm<sup>2</sup>. The pipe A lies 2.5m above pipe B, find the difference of pressure measured by mercury as fluid filling U tube.
3. State and prove Pascal's Law.
4. Derive an expression for the force exerted on a submerged inclined plane surface by the static liquid and locate the position of the centre of pressure.

**PART B**

( Answer any THREE, Each carries 10 Marks )

5. The velocity components in a two dimensional flow are  $u = y^3/3 + 2x - x^2y$  and  $v = xy^2 - 2y - x^3/3$  Show that these functions represent a possible case of an irrotational flow.

6. A venturimeter with a throat 100mm diameter is fitted in a vertical pipe line of 200 mm diameter with oil of specific gravity 0.85 flowing upwards. The venturimeter coefficient is 0.96. The difference between the two gauge readings is 28 kN/m<sup>2</sup> and pressure gauges are fitted 320 mm apart, one at the throat other at the inlet pipe. Find the flow rate and difference in levels of two limbs of mercury manometer, if it is connected to the tapping points and connecting pipe.
7. Two reservoirs 2000 m apart are connected by two pipes in parallel. One is 400 mm in diameter and the other is 300 mm. If the combined flow is 1 m<sup>3</sup>/s, find the velocity of flow in each pipe. Assume friction factor are same for both pipes.
8. Obtain Darcy Weisbach formula for the loss of head due to friction. What are the factors that influence this coefficient?

### PART C

( Answer Any 4 Questions Each Carries 10 Marks )

9. For the velocity profile for laminar boundary layer Determine the boundary layer thickness, shear stress, drag force and co-efficient of drag in terms of Reynold's number.
10. Explain the terms distorted model and undistorted model. What is the use of distorted models.
11. The frictional force on a flat plate when a fluid flows over it is given by the expression  $F_t = 0.664 B$  where B and L are the breadth and length of the plate respectively, U the free stream velocity of the fluid. Show that the frictional drag coefficient,  $C_f = \frac{1}{\sqrt{R}}$  where R is the Reynold's number.
12. Give an account of the types of similarities.

- 13. a)** What is a boundary layer? How the boundary layer thickness is defined ?
- b)** Explain the term Dimensional homogeneity. How it is obtained?
- 14.** State Buckingham's theorem? What are repeating variables? How are the repeating variables selected in dimensional analysis?

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