Roll No. Total No. of Pages : 02

Total No. of Questions: 09

B.Tech.(CE) (2011 Onwards) (Sem.-3)
FLUID MECHANICS-I
Subject Code: BTCE-301

Paper ID : [A1113]

Time: 3 Hrs. Max. Marks: 60

#### **INSTRUCTION TO CANDIDATES:**

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

### **SECTION-A**

# 1) Write briefly:

- a) Distinguish between gauge pressure and absolute pressure.
- b) State the different principles of measurement of pressure.
- c) Define 'total pressure on a surface' and 'centre of pressure' of a surface.
- d) State the limitations of the Bernoulli's theorem.
- e) What is an orifice metre?
- f) Explain lift and drag.
- g) What do you understand by the term thickness of boundary layer?
- h) What do you mean by 'Dimensional Analysis'?
- i) Define the term 'dimensional homogeneity'.
- j) Define surface tension and capillary.

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### **SECTION-B**

- 2) Explain Differential manometer with neat sketch.
- 3) Derive continuity equation in Cartesian coordinates.
- 4) Explain Rayleigh's and Buckingham's Pi method for dimensional analysis.
- 5) What is meta centric height? How it is determined?
- 6) What do you mean by Newtonian and non Newtonian fluids?

## **SECTION-C**

- 7) In an experiment a smooth two-dimensional flat plate is exposed to a wind of velocity 90 km/hr. If laminar boundary layer exists up to a value of  $R_{\rm nx} = 2 \times 10^5$ , find the maximum distance from the leading edge up to which laminar boundary layer exists and its maximum thickness. Take kinematic viscosity of air as  $1.6 \times 10^{-5} \, {\rm m}^2/{\rm s}$ .
- 8) A pipe 300 meters long has a slope of 1 in 100 and tapers from 1 metre diameter at the higher end to 0.5 metre at the lower end. The quantity of water flowing is 900 liters / second. If the pressure at the higher ends is 70 kPa, find the pressure at the lower end.
- 9) A flat plate 1.5m×1.5 m moves at 45 km/hour in stationary air of specific weight 11.3N/m<sup>3</sup>. If the coefficients of drag and lift 0.15 and 0.75 respectively find:
  - a) lift force
  - b) drag force
  - c) resultant force
  - d) power required to keep the plate in motion.

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