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 :
1. **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.

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 $R_{nx} = 2 \times 10^5$, 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 $1.6 \times 10^{-5} m^2/s$.

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×l.5 m moves at 45 km/hour in stationary air of specific weight 11.3N/m³. 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.