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

Q1. Answer briefly :

a) Define Ideal fluids.

b) Explain the property of fluids on the basis of molecular motion.

c) What forces act on fluid element in static equilibrium?

d) On what factors do the pressure variation in the vertical direction depends.

e) Distinguish between Pathlines and Streaklines.

f) Define uniform and non uniform flow.

g) Differentiate between free and forced vortex.

h) How is Bernouli's equation related to First Law of Thermodynamics?

i) Why is streamlining of automobiles of less practical importance than that of subsonic airplanes?

j) Distinguish between Pitot tube and Pitot- Static tube.

SECTION-B

Q2. The diameters of two glass limbs of a differential U tube manometer were found to be 5 mm and 6 mm respectively. In an experiment the differential pressure readings of 50,100, 250,400 and 500 mm were indicated by the manometer. Determine the percentage error caused by the capillary effect. Take surface tension of water as 0.0736 N/m and the angle of contact as zero.

Q3. A vertical side of reservoir has a rectangular opening 2.75 m long × 1.2 high. It is closed by a plate using 4 bolts placed at the corner of the opening. What would be the tension in the bolts if water stands to a height of 1.8 m above the top edge of the opening?

Q4. A pump is installed in a pipeline, 5 cm diameter, carrying oil of sp. Gr. 0.83. It returns the oil to a 5 cm diameter pipe at the same elevatioin with a pressure increase of 13.7 kN/m^2. The quantity of the oil flowing in the pipeline is 10 litres/sec. The motor driving the pump delivers 2.8 kW to the pump shaft. Calculate the loss of energy in the pump.

Q5. A jet plane which weighs 29.4 kN and has a wing area of 20 m^2 flies at a velocity of 950 km/hr when the engine delivers 7350 kW, 65% of the power is used to overcome the drag resistance of the wing.
Calculate the coefficients of drag and lift for the wing. The specific weight of the atmospheric air is 11.85 N/m^3.

Q6. A triangular notch is used to measure flow in a channel under a head of 20 cm. If the discharge is to be measured within 3% accuracy, what is the maximum velocity of approach that can be neglected?

SECTION-C

Q7. An oil tanker of 2.5 × 2.5 m square cross section is 4 m ling. Oil is filled upto a depth of 2m. At what acceleration is the direction of its length the tanker be moved so that the corner A is exposed? What is then the net horizontal force acting on the tanker sides? Take sp. gr. of oil as 0.8.

Q8. Water approaches the intake of the pump, the velocity varying inversely as the square of the radial distance from the intake. At a radial distance of 1.5 m, the velocity was found to be 0.58 m/s. What is the acceleration of flow at radial distances of 1.5 m, lm, and 0.50m from the intake? The streamlines are radial.

Q9. The discharge Q over a rectangular weir depends upon the head H over the weir, acceleration due to gravity g, length of the weir crest L, height of the weir crest over the channel bottom Z and the kinematic viscosity 'v' of the liquid. By the method of dimensional analysis, obtain an expression for the discharge Q in terms of dimensionless parameters.