Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards) (Sem.–4)

FLUID MECHANICS

Subject Code : BTME-403

Paper ID : [A1213]

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) Define specific viscosity.

(b) Define surface tension.

(c) State different types of fluid flow.

(d) Define the term buoyancy and centre of buoyancy.

(e) What is the stability criterion of submerged body?

(f) Define rotation and vorticity.

(g) Define stream function and velocity potential function.

(h) Distinguish between notches and weirs.

(i) What is the difference between orifice and mouthpiece?

(j) Define reynold's number.

SECTION-B

2. A rectangular box with base 2.5×4 m is filled with kerosene oil of specific gravity 0.8 to a depth of 6 m. Determine the resultant pressure and its point of application on the base and on each vertical face of the box.

3. Derive continuity equation in Cartesian coordinates.

4. What are the limitations and characteristic of flow net?

5. A sharp edged circular orifice of diameter 7.5 mm is provided in a tank containing water to a height of 1.2 m above the orifice. The jet strikes a wall 1.25 m away and 0.35 m vertically below the centre line of the contracted section of the jet. The actual discharge through the orifice is measured to be 40 kg of water in 5 minutes. Compute the orifice coefficients and the power loss at the orifice.

6. A 2.5 m ship model is tested in fresh water and measurement indicated that there was a resistance of 45 N when the model was moved at 2 m/s. Work out the velocity of 40 m prototype. Also calculate the force required to derive the prototype at this speed through sea water having density 1025 kg/m^3.

SECTION-C

7. Discuss in detail various minor losses of head in pipes.

8. An open cubical tank with each side 1.5 m contains oil of specific weight 7.5 kN/m^3 upto a depth of 1.5 m. Find the force acting on the side of the tank when it is being moved with an acceleration of 2 m/s^2 in vertical upward and downward directions. What would be the pressure at the bottom of the tank when acceleration rate is g m/s^2 vertically downwards?

9. A 2 m long pipe line tapers uniformly from 10 cm diameter to 20 cm diameter at its upper end. The pipe central line slopes upwards at an angle of 30° to the horizontal and the flow direction is from smaller to bigger cross-section. If the pressure gauges installed at the lower and upper ends of the pipe line read 200 kPa and 230 kPa respectively, determine the flow rate and the fluid pressure at the mid length of the pipe line by assuming no energy losses.