Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME) (Sem.–4) (2011 Batch)
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 has to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

SECTION-A

I. Write briefly :

   (i) Differentiate solids and fluids.

   (ii) What is Pascal's law and what are its engineering applications?

   (iii) Discuss metacentric height with respect to stability and comfort.

   (iv) What are the various ways of describing a flow pattern?

   (v) Define circulation and vorticity.

   (vi) What is momentum correction factor and what is its significance?

   (vii) Write a note on model studies.

   (viii) What are the flow regimes envisaged by Reynolds?

   (ix) Explain the concept of equivalent pipe.

   (x) What are the characteristics of a steady free water jet discharging from an orifice fitted in a tank?

SECTION-B

2. A vertical isosceles triangular gate is immersed in water with its vertex up. The base width of gate is 2 m and height 1.5 m. The vertex of gate is 1 m below the free water surface. Determine the total pressure force and its location.

3. The stream function in two-dimensional flow is $\psi = (6x - 4y + 7xy)$. Verify whether the flow is irrotational and determine the expression for the potential function. Also, determine the direction of a streamline at point $(1, -1)$.

4. Derive Bernoulli's equation for flow along a stream line.

5. Due to sudden enlargement of a horizontal pipe from 300 mm diameter to 600 m diameter, hydraulic gradient line rises by 1.5 mm. Determine discharge.

6. A venturimeter is used for the measurement of discharge in a horizontal pipe. The ratio of upstream pipe diameter to throat is 2:1, the upstream diameter being 300 mm. If differential pressure head between the upstream and throat is equal to 3 m head of water and loss of head through the meter is one-eight of the throat velocity head, calculate discharge in the pipe.

SECTION-C

7. A conical thrust bearing idealized as a cone of vertex angle 60°, maximum cone diameter 200 mm, rests and revolves about vertex over a uniform fluid layer of thickness 1 mm at 600 rpm. If viscosity of fluid is 1 Poise, calculate the power lost in overcoming the viscous resistance.

8. Two pipes each 300 m long are available for connecting to a reservoir from which a flow of 0.085 m^3/s is required. If diameters of the two pipes are 300 mm and 150 mm respectively, determine the ratio of head lost when the pipes are connected in series to the head lost when connected in parallel. Neglect minor losses.

9. A fluid flow situation depends upon velocity V, density p, pressure drop Δp, gravity g, length l, diameter d, viscosity μ, surface tension σ and bulk modulus of elasticity K. Find a set of dimensionless numbers using π-theorem method of dimensional analysis.