B.Tech. 3rd Semester (Civil Engg) F. Scheme

Examination, December–2014

FLUID MECHANICS–I

Paper–CE-205-F

Time allowed : 3 hours]   *[Maximum marks : 100*

Note :   *(i)*   ***Question No. 1 is compulsory.*** *Attempt one question from each section.*

      (ii)   *All questions carry equal marks.*

      (iii)   *Assume missing data, if any suitably.*

1.   Explain the following :   20

    (a)   Newtonian and non-Newtonian fluid

    (b)   Differential and sensitive manometers

    (c)   Laminar and turbulent flow

    (d)   Difference between stream lines and path lines

Section–A

2.   (a)   The velocity components in a two dimensional incompressible flow field are expressed as :

$$u = y^3/3 + 2x - x^2y, \quad v = xy^3 - 2y - x^3/3$$

Is the flow physically possible ? If so, obtain an expression for the stream function. What is the discharge between the streamlines passing through $(1, 3)$ and $(2, 3)$?   15

    (b)   Define streak line and path line.   5

3. (a) A rectangular plate 1.2 m × 0.4 m, weighing 970 N slides down a 45° inclined surface at a uniform velocity of 2.25 m/s. If the 2 mm gap between the plate and the inclined surface is filled with oil, determine its dynamic viscosity. 15

(b) Describe flownets briefly. 5

Section–B

4. (a) Describe briefly the experimental method of determination of the metacentric height of a floating object. 15

(b) What do you mean by stability of immersed and floating bodies ? 5

5. (a) Explain simple, differential and two liquid manometers with diagram. 10

(b) Derive pressure-density-height relationship. 10

Section–C

6. Sketch an orifice-meter and manometer arrangement, and derive an expression for the actual flow rate of an incompressible fluid through the orificemeter. 20

7. (a) Explain the methods of controlling boundary layer. 10

(b) Define boundary layer thickness. Differentiate between laminar and turbulent boundary layer. 10

Section–D

8. (a) Explain in detail geometric, kinematic and dynamic similarity. 10

   (b) What are the important dimensionless numbers ? Describe the significance of these numbers. 10

9. State Buckingham's π-theorem. Write procedure for solving problems by Buckingham's π-theorem. 20