TCE-301 1105 Printed Pages : 6

Paper Code & Roll No. to be filled in your Answer Book

Roll No.

B. Tech. II Year (III Sem.)

Odd Semester Examination-2015

Fluid mechanics

Time : 3 Hrs.] *[Max. Marks :100*

Unit 1

Answer Any Four (4x5=20)

1. The Velocity Distribution for flow over a flat plate is given by u=(2/3)y-y2, Where u is the point velocity in meter per second at a distance y meter above The plate. Determine the shear stress at y=0 and y=15 cm. Assume dynamic Viscosity as 8.63 poises?

2. The pressure outside the droplet of water of diameter 0.04 mm is 10.32 N/cm^2 (at atmospheric pressure). Calculate the pressure within the droplet if surface tension is given as 0.0725 N/m of water?

3. A stream function is given by ψ = 5x-6y. Calculate the velocity components and also magnitude and direction of the resultant velocity at any point?

4. One liter of crude oil weighs 9.6 N. Calculate its Specific weight, density and Specific volume.

5. A. Explain capillarity and derive an expression for capillary fall?

   B. Explain vapour pressure and cavitation?

Unit 2

Answer Any Four (4x5=20)

1. A simple U tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vaccum pressure is flowing. The other end of manometer is open to atmosphere. Find vaccum pressure in pipe, if difference of mercury level in the two limbs is 40cm and the height of fluid in the left from the centre of pipe is 15 cm below?

2. Determine total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Find the position of centre of pressure also?

3. An orfice meter with orfice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orficemeter gives a reading of 50

cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the coefficient of discharge of the orificemeter = 0.64?

4. Find the velocity of flow of an oil through a pipe, when the difference of mercury level in a differential U-tube manometer connected to the two tappings of the pitot tube is 100 mm. Take coefficient of pitot tube 0.98 and specific gravity of oil= 0.8?

5. Explain the terms:
Coefficient of velocity, C_v
Coefficient of contraction, C_c
Coefficient of discharge, C_d
What is the relation between them?

Unit 3

Answer Any Two (2x10=20)

1. Explain the following parameters:
   a) Reynold's number
   b) Froude's number
   c) Euler's number
   d) Weber's number
   e) Mach number

2. The time period (t) of a pendulum depends upon the length (L) of the pendulum and acceleration due to gravity (g). Derive an expression for the time period?

3. A pipe of diameter 1.5 m is required to transport an oil of specific gravity 0.90 and viscosity $3x10^{-2}$ poise at the rate of 3000 lit/s. Tests were conducted on a 15 cm diameter pipe using water at 20°C. Find the velocity and rate of flow in the model?

Unit 4

Answer Any Two (2x10=20)

1. Discuss the various types of major and minor energy losses in pipes in detail?

2. Find the head loss due to friction in pipe of diameter 300 mm and length 50 m, through which water is flowing with a velocity of 3 m/s using a. Darcy formula, b. Chezy's formula for which C=60?

3. A main pipe divides into two parallel pipes which again forms one pipe .The length and diameter for the first parallel pipe are 2000 m and 1 m respectively, while the length and diameter for second parallel pipe are 2000

m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main is 3 m^3/s. The coefficient of friction for each parallel pipe is same and equal to 0.005?

Unit 5

Answer Any Two (2x10=20)

1. A flat plate of 2m width and 4 m length is kept parallel to air flow at 5m/s velocity at 15°c. Determine length of plate over which boundary layer is laminar, shear at the location where boundary layer ceases to be laminar, and total force on both sides of the portion of that plate where boundary layer is laminar?

2. Derive an expression for displacement thickness(δ)

$$\delta^* = \int_0^{\delta}\left(1-\frac{u}{U}\right)dy$$

3. Explain the following terms:
   a) Pressure drag
   b) Friction drag
   c) Stream-lined body
   d) Bluff body
   e) Terminal velocity

P.T.O.

4. A metallic sphere of specific gravity 7 falls in an oil of density 800 kg/m3. The diameter of the sphere is 8 mm and it attains a terminal velocity of 40 mm/s. Find the viscosity of the oil in poise?

—x—