Code: 13A01408

R13

B.Tech II Year II Semester (R13) Regular Examinations May/June 2015

MECHANICS OF FLUIDS

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Barometric reading = 740 mm of mercury
Specific gravity of mercury = 13.6
Intensity of pressure = 50 kPa.
Express the intensity of gauge pressure in terms of meters of water and mercury.

(b) A soap bubble 70 mm diameter has an internal pressure in excess of the outside pressure of 18 N/m^2. What is tension in the soap film?

(c) Define rotation and vorticity.

(d) Give the assumptions of Bernoulli's equation.

(e) Find the discharge over a suppressed rectangular weir 4 m long with a head over the crest as 0.35 m.

(f) A compound piping system consists of 1800 m of 0.50 m, 1200 m of 0.40 m and 600 m of 0.30 m new cast iron pipes connected in series. Convert the system to an equivalent length of 0.40 m pipe.

(g) Define displacement thickness.

(h) If the velocity distribution in the boundary layer is given as $^{v}/_{V} = {}^{3}/_{2}\,\eta - {}^{1}/_{2}\,\eta^2$ in which $\eta = {}^{y}/_{\delta}$. Compute δ^*.

(i) What is an airfoil?

(j) A circular disc 3 m in diameter is held normal to a 26.4 m/s wind of density 1.2 kg/m^3. What force is required to hold it at rest? Assume coefficient of drag of disc as 1.2.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 A sliding gate 3 m wide and 1.5 m high lies in a vertical plane and has a coefficient of friction of 0.2 between itself and guides. If the gate weighs 30 kN, find the vertical force required to raise the gate if its upper edge is at a depth of 9 m from free surface of water.

OR

3 (a) A differential manometer connected at the two points A and B in a pipe containing an oil of specific gravity of 0.9 shows a difference in mercury levels as 160 mm. Find the difference in pressure at the two points.

(b) A 150 mm diameter shaft rotates at 1500 r.p.m in a 200 mm long journal bearing with 150.5 mm internal diameter. The uniform annular space between the shaft and the bearing is filled with oil of dynamic viscosity 1.0 poise. Calculate the shear force developed.

UNIT – II

4 If for a two-dimensional potential flow, the velocity potential is given by $\phi = x(2y - 1)$, determine the velocity at the point $P(5,6)$. Find also the value of stream function at the point P.

OR

5 The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1and 2 respectively. The rate of flow through pipe is 35 lps. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2.

Contd. in page 2

www.ManaResults.co.in

UNIT – III

6 (a) Explain Reynold's experiment.

(b) Derive Darcy's equation.

OR

7 A venturimeter has its axis vertical the inlet and throat diameters being 150 mm and 75 mm respectively. The throat is 225 mm above inlet and K = 0.96. Petrol of specific gravity 0.78 flows up through the meter at a rate of 0.029 m^3/s. Find the pressure difference between the inlet and the throat.

UNIT – IV

8 Give the definition for boundary layer and explain the formation of boundary layer along a thin flat plate.

OR

9 Explain the separation of boundary layer. Also explain the way in which you control the separation of boundary layer.

UNIT – V

10 Calculate the total drag, shear drag and the pressure drag exerted on 1 m length of an infinite circular cylinder which has a diameter equal to 30 mm air of density 1.236 kg/m^3 flowing past the cylinder with velocity 3.6 m per minute. Take total drag coefficient equal to 1.4 and shear drag coefficient equal to 0.185.

OR

11 An aeroplane weighing 39.24 kN is flying in a horizontal direction at 360 km/h. The plane spans 15 m and has a wing surface area of 35 m^2. If drag coefficient C_D = 0.03 and for air $\rho = 1.22\ kg/m^3$ determine coefficient of lift, power required to drive the plane and theoretical value of the boundary layer circulation.

*****

www.ManaResults.co.in