Code: 13A01303

R13

B.Tech II Year I Semester (R13) Supplementary Examinations June 2015

FLUID MECHANICS

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

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

(a) Define and differentiate absolute and gauge pressures.
(b) Define total pressure and centre of pressure.
(c) For what type of flow velocity potential exists. And prove it.
(d) What is flownet?
(e) List out the forces that are considered in Euler's equation.
(f) What is vena contracta and where does it occur.
(g) What is an orifice and what is a mouth piece?
(h) Define velocity of approach.
(i) What is Darcy's equation? Also name the various terms involved in that equation.
(j) Sketch the variation of mean velocity and shear stress for a case of steady laminar flow through a circular pipe.

PART – B

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

UNIT - I

2 (a) Define surface tension and viscosity of a fluid.
(b) When do we use differential manometers and micro-manometers?

(OR)

3 A triangular gate which has a base of 1.5 m and an altitude of 2 m lies in a vertical plane. The vertex of the gate is 1 m below the surface in a tank which contains oil of specific gravity 0.8. Find the forces exerted by the oil on the gate and the position of the centre of pressure.

UNIT - II

4 (a) Define meta centre and meta centric height.
(b) A wooden cylinder of circular section and uniform density, specific gravity 0.63 is required to float in oil of specific gravity 0.8. If the diameter of the cylinder is 'd' and its length is 'l' find the maximum value of l in terms of d so that the cylinder floats with its longitudinal axis vertical.

(OR)

5 (a) What type of acceleration can be expected when stream lines are: (i) straight and parallel. (ii) straight converging. (iii) concentric. (iv) curved converging.
(b) A stream function in a two-dimensional flow is $\Psi = 2xy$. Show that the flow is irrotational and determine the corresponding velocity potential ϕ.

Contd. in page 2

UNIT - III

6 (a) Derive Bernoulli's equation. Also list out the various assumptions involved.

(b) A pipe 300 m long has a slope of 1 in 100 and tapers from 1.2 m diameter at the high end to 0.6 m diameter at the low end. Quantity of water flowing is 5400 lpm. If the pressure at the high end is 68.67 kPa, find the pressure at the low end neglecting the minor losses.

(OR)

7 (a) Compare and contrast venturimeter and orifice meter.

(b) An orifice meter with orifice 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 orifice meter 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 orifice meter = 0.65.

UNIT – IV

8 A large tank having a circular orifice 6.45×10^{-4} m^2 in area in its vertical side rests on a smooth horizontal surface. When the depth of water in the tank is 1.22 m the discharge through the orifice is 1118.34 N per minute and a horizontal force of 9.123 N in line with the centre of the orifice is required to keep the tank at rest. From these data find the coefficients of C_V, C_C and C_d.

(OR)

9 (a) Give the advantages of triangular weir over rectangular weir.

(b) Rain falls over a catchment area of 26 sq km at the rate of 1 mm per hour. The rain water flows over a weir with a free length of 12 m constructed in 6 days each 2 m long. Using Francis formula find the head over the crest.

UNIT – V

10 (a) Define equivalent pipe and derive the corresponding equation.

(b) The difference in water surface levels in two tanks which are connected by three pipes in series of lengths 300 m, 180 m and 200 m and of diameters 300 mm, 200 mm and 400 mm respectively is 12 m. Determine the rate of flow of water if coefficient of frictions are 0.005, 0.0052 and 0.0048 respectively neglecting minor losses.

(OR)

11 An oil viscosity 0.12 Ns/m^2 and relative density 0.92 is flowing through a circular pipe of diameter 60 mm and of length 300 m. The rate of fluid through the pipe is 3.5 lps. Find the pressure drop in a length of 300 m and also shear stress at the pipe wall.

*****