Code: 15A01305

R15

B.Tech II Year I Semester (R15) Supplementary Examinations June 2018

FLUID MECHANICS

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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

(a) State Pascal's law.

(b) Calculate the specific weight, density and specific gravity of 1 litre of liquid which weighs 7 N.

(c) Distinguish between steady flow and unsteady flow.

(d) Define by buoyancy and center of buoyance.

(e) Define Bernoulli's theorem and list their assumptions.

(f) Name the flow measuring instruments which use the Bernoulli's equation.

(g) Define Cippoletti Weir.

(h) How are orifices and mouth piece classified?

(i) What do you mean by equivalent pipe?

(j) Enlist minor losses in flow through pipes.

PART – B

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

UNIT – I

2 (a) Derive the expression of dynamic viscosity and hence deduce kinematic viscosity.

(b) One litre of oil at 40℃ temperature has mass 900 gms. Calculate the mass density, specific weight, specific volume and specific gravity of oil.

OR

3 (a) Derive an expression for total pressure and center of pressure for a vertical plane surface submerged in a liquid.

(b) A circular plate 3.0 m diameter is immersed in water such a way that its greatest and least depth below the free surface is 4 m and 1.5 m respectively. Determine the pressure on one face of plate and position of centre of pressure.

UNIT – II

4 (a) Derive an expression for three dimensional continuity equations.

(b) In two dimensional potential flow, the velocity potential function is given by $\Phi = 4x(3y - 4)$. Determine the value of stream function at point (3, 4).

OR

5 A rectangular pontoon is 4 m long, 3 m wide and 1.4 m height. The depth of immersion of the pontoon is 1.0 m in sea water. If the centre of gravity is 0.7 m above the pontoon. Determine the metacentric height if the density of sea water is 1030 kg/m^3.

UNIT – III

6 (a) Derive an expression for determination of discharge through an orifice meter.

(b) A 300 mm x 150 mm venturimeter is held vertically carrying oil of specific gravity 0.9, flowing upwards. The difference in elevation of the throat section and the entrance section of the venturimenter is 300 mm. The differential U-tube mercury manometer shows a gauge deflection of 250 mm, if cd = 0.98 calculate the rate of flow of oil. Pressure difference between entrance and exit section.

OR

7 (a) Explain briefly the various forces acting on a fluid in motion.

(b) A pitot tube is used to measure the velocity of water in a pipe. The stagnation pressure head is 8 m and the static head is 6.5 m. Calculate the velocity of flow. Take C for pitot tube as 0.98.

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UNIT – IV

8 (a) Derive an expression for discharge over a rectangular notch.

(b) Water flows over a rectangular sharp crested weir 1 m long, head over the sill of the weir being 0.66 m. The approach channel is 1.4 m wide and the depth of the flow in the channel is 1.2 m. Determine the rate of discharge over the weir. Consider also the velocity of approach and the effect of end contractions. Take coefficient discharge of weir as 0.6.

OR

9 (a) Derive an expression for a discharge over a rectangular orifice.

(b) Calculate the discharge of water through a 50 mm diameter external mouth piece fitted to the side of a tank in which a head is maintained at 5 m. Take cd is 0.85 and the atmospheric pressure head is 10.33 m. Also determine the absolute pressure at venacontracta.

UNIT – V

10 (a) Write short notes on energy gradient line and hydraulic gradient line.

(b) The rate of flow of water through the horizontal pipe is 0.25 m^3/s. The diameter of the pipe is 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2. Find; (i) loss of head due to sudden enlargement. (ii) pressure intensity in large pipes.

OR

11 (a) Derive an expression for Hagen Poiseulle equation for a circular pipe.

(b) A lubricating oil of viscosity 1 poise and specific gravity 0.9 is pumped through a 30 mm diameter pipe. If the pressure drop / m length of the pipe is 20 kn/m^2, find the (i) flow rate. (ii) shear stress@ the pipe wall. (iii) Reynolds number. (iv) power required / 50 m length of the pipe to maintain the flow.

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