Code: 15A01305

R15

B.Tech II Year I Semester (R15) Regular Examinations November/December 2016

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) Find the absolute pressure at a depth of 5 m below the surface of a liquid of relative density 0.85. The barometric reading on the surface is 750 mm of mercury.

(b) What is the use of differential manometers and micro manometers?

(c) Give the definition for meta-centre.

(d) For what type of flow stream function exists and similarly for what type of flow velocity potential exists.

(e) What is kinetic energy correction factor?

(f) A nozzle is fitted at the end of a pipe of length 300 m and of diameter 100 mm. For maximum power transmission through the nozzle, find the diameter of the nozzle taking f = 0.009.

(g) What is a depressed nappe? And what will be its effect on the actual discharge over a weir.

(h) What is a re-entrant mouthpiece? Also give it's another name.

(i) Write Darcy – Weisbach equation.

(j) What is Prandtl mixing length?

PART - B

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

UNIT - I

2 (a) A sleeve 10 cm long encases a vertical metal rod 3.0 cm in diameter with a radial clearance of 0.02 mm. If when immersed in an oil of viscosity 6.0 poise, the effective weight of the sleeve is 7.5 N. At what velocity will the sleeve slide down the rod?

(b) Define the terms viscosity, surface tension and specific gravity.

OR

3 (a) A circular annular area of 2.0 m outer diameter and 1.0 m inner diameter is immersed vertically in water with the center of the area at 3.0 m below the water surface. Find the force exerted on one side of the area and the location of the centre of pressure.

(b) State and prove Pascal's law.

UNIT - II

4 Find the density of a metallic body which floats at the interface of mercury of specific gravity 13.6 and water such that 40% of its volume is sub-merged in mercury and 60% in water.

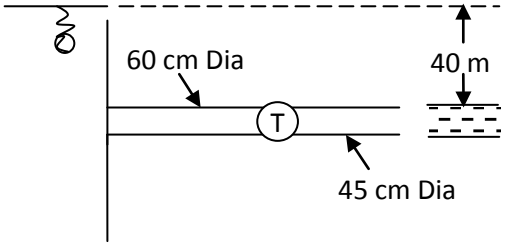
OR

5 An open circular cylinder of 15 cm diameter and 100 cm long contains water upto a height of 80 cm. Find the maximum speed at which the cylinder is to be rotated about its vertical axis so that no water spills.

Contd. in page 2

UNIT - III

6 A turbine is set 40 m below the water level of a reservoir and is fed by a 60 cm diameter pipe. A short pipe of 45 cm diameter discharges the water from the turbine to atmosphere as shown in figure below.



Neglecting friction estimate the power extracted by the turbine when the discharge is 0.8 m^3/s. Also estimate the same considering a total frictional loss of 10 m.

OR

7 What is venturimeter? What is the principle behind it? Also derive the equation for rate of flow through a pipeline.

UNIT - IV

8 (a) A closed tank partially filled with water discharges through an orifice of 12.5 mm diameter and has a coefficient of discharge of 0.65. If air is pumped into the upper part of the tank, determine the pressure required to produce a discharge of 36.6 litres/minute when the water surface is 1 m above the outlet.

(b) Give the classification of orifices.

OR

9 Find the depth and top width of a V-notch capable of discharging a maximum of 0.7 m^3/s and such that the head shall be 75 mm for a discharge of 5.6 lps. Its C_d is the same as that of a similar (in material and sharpness of edges only) right-angled V-notch for which $Q = 1.407\ \mathrm{H}^{5/2}$.

UNIT - V

10 A pipe 50 mm diameter is 6 m long and the velocity of flow of water in the pipe is 2.4 m/s. What loss of head and the corresponding power would be saved if the central 2 m length of the pipe was replaced by 75 mm diameter pipe, the change of section being sudden? Take $f = 0.04$ for the pipes of both diameters.

OR

11 (a) Explain Reynold's experiment.

(b) An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of fluid through the pipe is 3.5 lps. Find the pressure drop in a length of 300 m.

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