Code: 9A01304

R09

B. Tech II Year I Semester (R09) Supplementary Examinations, May 2013

FLUID MECHANICS

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) What are the different devices used for pressure measurement?

(b) Explain in detail about inverted U tube manometer.

2 A trapezoidal plate of top width 12 m, bottom width 10 m and height 7 m is immersed vertically in water with its parallel sides parallel to the water level and its top edge is at a depth of 5 m below the water level. Find the water thrust on one side of the plate and depth of centre of pressure.

3 (a) The velocity potential function is given by $\Phi = x^2 - y^2$. Calculate the velocity components in x and y directions. Also show that Φ represents a possible flow of fluid flow.

(b) A 40 cm diameter pipe conveying water, branches into two pipes of diameters 30 cm and 20 cm respectively. If the average velocity in the 40 cm diameter pipe is 3 m/s, find the discharge in this pipe.

4 (a) Derive Bernoulli's equation from Euler's equation of motion.

(b) Mention the assumptions made during the derivation.

5 Explain boundary layer thickness, displacement thickness, momentum thickness and energy thickness.

6 Find the mean velocity in terms of maximum velocity for laminar flow between two parallel stationary plates. Also draw the velocity and shear stress distributions for the same.

7 A pipe line, 300 mm in diameter and 3200 m long is used to pump up 50 kg per second of oil whose density is 950 kg/m^3 and whose kinematic viscosity is 2.1 stokes. The centre of the pipeline at the upper end is 40 m above than that at the lower end. The discharge at the upper end is atmospheric. Find the pressure at the lower end and draw the hydraulic gradient and the total energy line.

8 A venturimeter is to be fitted in a pipe of 20 cm diameter where pressure head is 7.6 m of flowing fluid and the maximum flow is 8100 litres per minute. Find the least diameter of the throat to ensure that the pressure head does not become negative. Take discharge coefficient for the meter as $C_d = 0.96$. What is the quantity of liquid flowing through it when a differential manometer shows a steady deflection of 20 cm of mercury?

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