C 10035

Name: .....

Reg.No. .....

THIRD SEMESTER B.TECH. DEGREE EXAMINATION, DECEMBER 2010

ME/AM .09.303/PTME.09.302 – Fluid Mechanics

Time: Three Hours

Maximum: 70 marks

Part - A (5 X 2 = 10 marks)

Answer all questions

1. Define capillarity.
2. Define centre of buoyancy.
3. Give an expression for loss of head due to sudden enlargement of the pipe.
4. Define rotational flow.
5. What are the assumptions are made to derive the Bernoulli's equation.

Part - B (4 X 5 = 20 marks)

Answer any four questions

6. What is Euler's equation of motion? How will you obtain Bernoulli's equation from it?
7. Explain the Pascal law.
8. Explain absolute, gauge and vacuum pressures.
9. Derive the expression for coefficient of Pitot tube.
10. A circular tank of diameter 1.25 m contains water up to a height of 5m. An orifice of 50mm diameter is provided at the bottom, If $C_d = 0.62$, find the height of water above the orifice after 1.5 minutes.
11. The diameters of a pipe at the sections 1 and 2 are 10cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/s. Determine also the velocity at section 2.

Part – C (4 X 10 = 50 marks)

Answer all questions

12. If the velocity of a fluid over a plate is a parabolic with the vertex 20 cm from the plate, where the velocity is 120 cm/s. Calculate the velocity gradients and shear stresses at a distance of 0, 10 and 20 cm from the plate, if the viscosity of the fluid is 8.5 poise.

(OR)

13. A wooden log of 0.6m diameter and 5m length is floating in river water. Find the depth of wooden log in water when the specific gravity of the log is 0.7.

14. The velocity vector in a fluid flow is given by

$V = 4x^3i - 10x^2yj + 2tk.$

Find the velocity and acceleration of the fluid particle at (2, 1, 3) at time t = 1.

(OR)

15. Derive from first principles the condition for irrotational flow. Prove that for potential flow both the stream function and velocity potential function satisfy the Laplace equation.

16. Derive Euler's equation of motion.

(OR)

17. Find the discharge over a rectangular weir of length 100m. The head of water over the weir is 1.5 m. The velocity of approach is given as 0.5 m/s. Take $C_d = 0.6$

18. A crude oil of viscosity 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100mm and of length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100kg of oil is collected in a tank in 30 seconds.

(OR)

19 Derive the expression for displacement thickness and momentum thickness of a boundary layer.

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