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VASAVI COLLEGE OF ENGINEERING (*Autonomous*), HYDERABAD
B.E. (Mech. Engg.) II Year I-Semester (Old) Examinations, Nov./Dec.-2016

Fluid Dynamics

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. What is vapour pressure?

2. Define stream line, streak line and path line.

3. Differentiate between local acceleration and convective acceleration.

4. List out the instruments to measure the discharge through pipes and name the efficient instrument.

5. What is the significance of moody's diagram?

6. Differentiate between upper and lower critical Reynolds number.

7. Define Laminar sub-layer.

8. What is Magnus effect?

9. Write the Bernoulli's equation for adiabatic process.

10. What is meant by isentropic process?

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) A 90 N rectangular solid block slides down a 30^0 inclined plane. The plane is lubricated by a 3 mm thick film of oil of relative density 0.90 and viscosity 8.0 poise. If the contact area is 0.3 m^2, estimate the terminal velocity of the block.

b) Define flownet and write its uses and limitations.

12. a) Derive 3 D continuity equation in Cartesian coordinates.

b) A 45^0 deflection angle reducing bend lies in a horizontal plane and tapers from 60 cm diameter to 30 cm diameter at the outlet. The pressure at the inlet is 15 kPa and the flow through the bend is 0.5 m^3 /s of water. Assuming friction loss of 20% of kinetic energy at inlet, compute the magnitude and direction of the resultant force exerted by the water on the bend.

13. a) Derive Darcy - Weisbach equation.

b) Explain Reynolds experiment with neat sketch.

14. a) What do you mean by boundary layer separation? What is the effect of pressure gradient on boundary layer separation?

b) A man weighing 900 N descends to the ground from an aeroplane with the help of a parachute against the resistance of air. The velocity with which the parachute, which is hemispherical in shape, comes down is 20 m/s. Find the diameter of the parachute. Assume $C_D = 0.5$ and density of air = 1.25 kg/m^3

15. a) Derive the expression for stagnation pressure.

b) A projective is travelling in air having pressure and temperature of 88.3 kN/m² and -2⁰C. If the mach angle is 40⁰, find the velocity of projectile if K = 1.4 ad R = 287 J/kg⁰K.

16. a) Distinguish between:
   i) steady flow and unsteady flow   ii) Rotational and irrotational flow

b) What is a venturimeter? Derive an expression for the discharge through venturimeter.

17. Answer any *two* of the following:
   a) Characteristics of Laminar and turbulent boundary layer.
   b) Derive the expression for Stagnation pressure.
   c) Laminar and turbulent flow.

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