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Code No.: 21415 S

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. II Year (Mech. Engg.) I-Semester Supplementary Examinations, May/June-2017

Mechanics of Fluids

Time: 3 hours

Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

1. Distinguish between 'mass density' and 'weight density'.
2. What is kinematic viscosity? State its units.
3. Differentiate between 'stream function' and 'velocity potential'.
4. What is a flow net? What are its uses?
5. What are the applications of Bernoulli's theorem?
6. What is the principle involved in Pitot tube?
7. Write the physical significance of Reynolds number.
8. Differentiate between laminar and turbulent flow.
9. Define boundary layer and give its significance.
10. Define drag and lift of an aerodynamic body.

Part-B (5 × 10 = 50 Marks)

11. a) Explain the terms 'total pressure' and 'centre of pressure'. [4]
b) The clearance between two plates is 0.8 mm and is filled with a lubricating oil of specific gravity 0.8 and Kinematic viscosity 1.25 stokes. If the upper plate moves with a velocity of 40 m/sec, determine the shear stress induced in the lube oil and calculate the drag force per unit area. [6]
12. a) Write the expression of the continuity equation in three dimensions (Cartesian co-ordinates) for steady incompressible fluid flow. [2]
b) A fluid flow field is given by $\mathbf{V} = (x^2y) \mathbf{i} + (y^2z) \mathbf{j} - (2xyz + yz^2) \mathbf{k}$. Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity at the point (2, 1, 3). [8]
13. a) Write an expression for Impulse Momentum equation and state its applications. [3]
b) A horizontal Venturimeter with inlet and throat diameters 0.3 m and 0.15 m respectively is used to measure the flow of water. The reading of the differential manometer connected to the inlet and throat is 0.2 m of Mercury. Determine the rate of flow. Take $C_d = 0.98$. [7]
14. a) Derive Hagen-Poiseuille equation for laminar flow in circular pipe line. [7]
b) Water flows through a pipe 0.2 m diameter and 0.6 m long, with a velocity of 2.5 m/sec. Find the head lost in friction by using the Darcy's formula assuming $f = 0.005$. [3]

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15. a) Explain the development of boundary layer formation over a flat plate with a neat sketch. [6]
 b) Define boundary layer thickness, displacement thickness, momentum thickness and energy thickness. [4]
16. a) Explain the principle of working of simple and differential manometers. [5]
 b) A stream function is given by $\psi = 5x - 6y$. Calculate the velocity components and also calculate the magnitude and direction of the resultant velocity at any point. [5]
17. Answer any *two* of the following:
- a) Short note on Venturimeter [5]
 - b) Losses in pipe flows [5]
 - c) How the separation of the boundary layer is controlled? [5]
