Hall Ticket Number:

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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. II Year (Mechanical) I-Semester (Main) Examinations, December – 2015

Fluid Dynamics

Time: 3 hours Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

1. If a certain liquid has a dynamic viscosity of 0.073 poise and specific gravity of 0.87. Compute the kinematic viscosity of the liquid in stokes.
2. Distinguish between ideal and real fluids.
3. If Stream Function (Ψ) = 4xy, calculate the Velocity Potential (ϕ).
4. What is Pitot tube? How it is used to measure velocity of flow at any point in a pipe or channel?
5. Write the significance of Reynolds number.
6. A fluid of viscosity 8 poise and specific gravity 1.2 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is 210 N/m^2. Compute the pressure gradient.
7. With the aid of sketches, illustrate the methods to avoid boundary layer separation.
8. Differentiate between a stream lined body and a bluff body.
9. What is Mach Cone?
10. Derive Bernoulli's equation for Adiabatic Process.

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

11. a) Prove that the stream lines and equipotential lines form a set of mutually perpendicular lines.

    b) A cylinder of 100 mm diameter and 300 mm length rotates about a vertical axis inside a fixed cylinder of 105mm diameter and 300 mm length. If the space between the two cylinders is filled with liquid of dynamic viscosity 0.125 N-s/m^2, determine the speed of rotation of the cylinder which will be obtained if an external torque of 1 Nm is applied to it.

12. a) What is an Impulse-momentum equation? Derive its expression when a flowing fluid exerts forces on a pipe bend.

    b) A venturimeter with 150mm diameter at inlet and 100 mm at throat is laid with its axis horizontal and is used for measuring the flow of oil of specific gravity 0.9. The oil mercury differential manometer shows a gauge difference of 200 mm. Calculate the discharge. Assume the coefficient of discharge for the venturimeter as 0.98.

Contd... 2

13. a) In Hagen Poiseulle's equation for steady laminar flow through a circular pipe, prove that the velocity distribution across the section is parabolic and the average velocity is half of the maximum velocity.

b) The discharge of water through a horizontal pipe is 0.25 m^3/sec. Its diameter, which is 200 mm suddenly, enlarges to 400 mm. If the intensity of pressure of water in the smaller pipe is 120 KN/m^2, determine:

i) Loss of head due to sudden enlargement and

ii) Intensity of pressure in the large pipe.

14. a) Explain the concept of boundary layer theory across a flat plate with the help of neat figures.

b) In a wind tunnel, experiments were conducted with a wind speed of 50 km/h on a flat plate of size 2 m long and 1 m wide. The mass density of air is 1.15 kg/m^3. The plate is kept at such an angle that coefficients of lift and drag are 0.75 and 0.15 respectively.

Evaluate : a) Lift force b) Drag force c) Resultant
d) Power exerted by the air stream or the plate.

15. a) Derive Bernoulli's equation in compressible fluid flow under Adiabatic process.

b) An aeroplane is flying at 1000 km/hr through still air having pressure of 78.5 kN/m^2 (abs) and temperature of -8°C. Compute stagnation pressure, stagnation temperature and stagnation density.

Take R = 287 J/Kg° K and K = 1.4

16. a) Define Vapour pressure and write its importance in the flow process.

b) A pipe 300 m long slopes down at 1 in 100 and tapers from 1.0 m diameter at the higher end to 0.5 m diameter at the lower end. Quantity of water flowing is 90 liters/sec. If the pressure at higher end is 70 KN/m^2, calculate the pressure at the lower end.

17. Write short notes on any **two** of the following:

a) Moody's diagram
b) Magnus effect
c) Mach number and its significance.