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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Mech. Engg.) II Year I-Semester (Main) Examinations, Nov./Dec.-2016

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 × 2 = 20 Marks)

1. Differentiate between 'ideal fluids' and 'real fluids'.
2. What is meant by vapour pressure of a fluid? Give its significance.
3. Define local and convective accelerations in a fluid flow.
4. What is the concept of 'stream tube' in fluid mechanics?
5. What do you understand by Impulse Momentum equation?
6. Calculate the velocity of water flow through a pipe, if the water rises by 1 m in the Pitot tube above the free surface of pipe (take Velocity coefficient as 0.98).
7. What are the factors influencing the frictional loss in pipe flow?
8. Write the Hagen-Poiseuille equation for laminar flow.
9. Differentiate between a laminar and turbulent boundary layer.
10. What is Magnus Effect?

Part-B (5 × 10 = 50 Marks)

11. a) A cylinder of diameter 15 cm and weight 90 N slides a distance of 12.5 cm in a lubricated pipe. The clearance between the pipe and cylinder is 2.5×10^{-3} cm. The cylinder is noted to decelerate at a rate of 0.6 m/s^2 when the speed is 6 m/s. Calculate the viscosity of oil used for lubricating the pipe. [5]

    b) A horizontal pipe contains an oil of specific gravity 0.9. A differential manometer connected at the two points A and B of the pipe shows a difference in mercury level as 15 cm. Find the difference of pressure at the two points. [5]

12. a) List out the properties of 'Velocity potential' and 'Stream function'. [4]

    b) The velocity potential function is given by $\phi = 5\ (x^2 - y^2)$. Calculate the velocity components at the point (4, 5). [6]

13. a) Derive Bernoulli's equation and state its assumptions/limitations. [7]

    b) Differentiate between Venturimeter and Orifice meter. [3]

14. a) Draw Moody's chart and explain its importance. [4]

    b) An oil of specific gravity 0.7 is flowing through a pipe of 0.3 m diameter at the rate of 0.5 m^3/sec. Find the head lost due to friction and power required to maintain the flow for a length of 1000 m. Take kinematic viscosity = 0.29 stokes. [6]

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15. a) Explain the effect of pressure gradient on boundary layer separation with a neat sketch. [6]

    b) Find the displacement thickness and the momentum thickness for the velocity distribution in the boundary layer given $\frac{u}{U} = \frac{y}{\delta}$ where u is the velocity at distance 'y' from the plate and u = U at y = δ where δ is the boundary layer thickness. [4]

16. a) With a neat sketch, explain Piezometer. [5]

    b) Write a brief notes on Reynold's Transport Theorem. [5]

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

    a) Forces on a pipe bend [5]

    b) Upper and lower critical values of Reynold's number for flow in pipes [5]

    c) Drag and Lift co-efficients [5]

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