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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS: Civil Engg.) IV-Semester Main Examinations, May-2018

Fluid Mechanics-I

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. Define vapour pressure.
2. Explain the difference between Metacenter and Metacentric height.
3. If stream function in 2-Dimensional flow is given by 2xy, find velocity potential function.
4. Define flow net and write its uses.
5. Write the applications of Bernoulli's equation.
6. Write the Francis formula for rectangular weir by considering end contractions and velocity of approach.
7. Explain the Importance of Moody's diagram.
8. Explain the conditions for pipes in series and pipes in parallel.
9. Define Mach number and derive equation for Mach number.
10. Define Reynold's model law and give examples.

Part-B (10 × 5 = 50 Marks)

(All Sub-Questions carry equal marks)

11. a) Explain with a neat sketch the principle and working of Bourdon Gauge.

    b) A rectangular plane surface is 2m wide and 3m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and coincides with water surface.

12. a) Derive equation of Continuity in 3-Dimensional flow in Cartesian coordinates.

    b) 250 Lt/s of water is flowing in a pipe having a diameter of 30 cm. If the pipe is bent by 45^0, Calculate the magnitude and direction of resultant force on the bend. The pressure of water flowing is 39.24 N/cm^2.

13. a) Prove that in case of forced vortex flow the rise of liquid level at the ends is equal to the fall of liquid level at the axis of rotation.

    b) A horizontal venturimeter is to be fitted in a pipe of 20 Cm diameter where pressure head is 7.6m of flowing fluid and the maximum flow rate is 8100 Liters / Minute. Find the least diameter of throat to ensure that the pressure head does not become negative. Consider coefficient of discharge of venturimeter as 0.96.

14. a) Derive an expression for head loss due to friction in turbulent flow through circular pipes.

    b) A fluid of viscosity 0.7 Ns/m^2 and specific gravity 1.3 is flowing through a circular pipe of diameter 10 cm. The maximum shear stress at the pipe wall is 196.2 N/m^2. Evaluate a) pressure gradient and b) Average velocity.

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15. a) The discharge (Q) of a rectangular weir depends upon the head (H), acceleration due to gravity (g) ,length of weir crest (L) , height of weir crest over channel bottom (Z) and kinematic viscosity(υ). Develop a functional relationship between the above variables.

    b) A 7.2 m height and 15 m long spillway discharges 94 m^3/s discharge under a head of 2m. If a 1:9 scale model of this spillway is to be constructed, determine a) model dimensions b) head over spillway and c) model discharge.

16 a) Calculate the volume of water displaced and position of centre of buoyance for a wooden block of width 2.5 m and depth 1.5 m, when it floats horizontally in water. The density of wooden block is 650 kg/m^3 and its length is 6 m.

    b) The velocity components in a fluid flow are given by: $u = 2xy$, $v = a^2 + x^2 - y^2$, derive the stream function.

17. Answer any ***two*** of the following

    a) Applications of impulse momentum equation.

    b) Reynolds experiment and its significance.

    c) Explanation of various types of similarities.