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Time: 3 hours

Code No. :14105

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD B.E. (CBCS: Civil Engg.) IV-Semester Main Examinations, May-2018

Fluid Mechanics-I

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B Part-A ($10 \times 2 = 20$ 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 $(10 \times 5 = 50 \text{ Marks})$

(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 45⁰, Calculate the magnitude and direction of resultant force on the bend. The pressure of water flowing is 39.24 N/cm².
- 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/m² 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/m². Evaluate a) pressure gradient and b) Average velocity.

- 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(v). Develop a functional relationship between the above variables.
 - b) A 7.2 m height and 15 m long spillway discharges 94 m³/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/m³ 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.

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- 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.

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- (i) If you will a next sketch the principle and working of Boundary Linua
- 11 A rectangular plane surface to 2n wide and 3m detp. If flux to vertical plane in warm, Deva.eliter the tank pressure and position of centre of pressure of the plane surface when is upper edge is bailcourd and coincider with ware surface.
 - 14 All a section of Continuity in J-Dimensional flow in Canadian continues.
 - b) Provide not realize notificewing in a pipe having a diameter of 50 cm. (Cdu phyce a bruit by 45°. Caltuit no the tragging de and direction of retainent force on the head. (The pressure of wave flowing is 39:24 Mem?.)
- 13. a) Prove that is must of forest wortex flow the rist of liquid level at the ends to optici to the fail of lighted level at the axis of rotation.
- (a) A horizontal venturinezer is to be fitted in a plan of 30 Cm dimenter when pressure bood is 7.6m of flowing fluid and the maximum flow relations \$100 Length Missue Find the lengt dimenter of threat to ensure the the pressure hand does not because regulities. Consists coefficient of finduces of venturinezer as 0.56.
- 14 al Derive in extremision for head less des to friction to sufficient flow through eigenly a class.
- b) A flatch of viscosity 0.7 h and specific gravity 1.3 is frames through a distalar ripe of dimension 10 cm. The maximum shear stress of the pipe wall is 196.5 Went's its shear? a) accorney gradient and b) Average velocity.