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Code No.: 21415 O3

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

Fluid Dynamics

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. Differentiate between ideal and real fluids.

2. Viscosity of water at 20°C -----.

3. Define flownet and write its uses.

4. Write the relation between absolute pressure, gauge pressure and atmospheric pressure.

5. List out minor losses in pipes.

- 6. Show that $f = 64/R_e$ where f is friction factor and R_e is reynolds number.
- 7. Define displacement thickness and energy thickness.

8. Differentiate between pressure drag and friction drag.

- 9. Differentiate between adiabatic and isothermal process.
- 10. Define mach number and classify the flows based on it.

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

- 11. a) Define viscosity and derive Newton's law of viscosity.
 - b) The velocity components in a 2D flow field for an incompressible fluid are as follows: $u = y^3/3 + 2x - x^2 y$ and $v = xy^2 - 2y - x^3/3$ obtain an expression for the stream function Ψ
- 12. a) Explain differential U tube manometer with neat sketch.
 - b) In a smooth pipe of uniform diametre 25 cm, a pressure of 50 kPa was observed at section 1 which was at elevation 10.00 metres at another section 2 at elevation 12.00 metres. The pressure was 20 kPa, velocity was 1.25 m/sec. Determine the direction of flow and the head loss between these two sections. The fluid in the pipe is oil of specific gravity 0.89.
- 13. a) Derive Hagen Poiseuilles's equation for Laminar flow through circular pipes.
 - b) A smooth pipe of diametre 80 and 1000 m long is carrying water at 8 litre per second. If kinematic viscosity is 0.015 stockes for water and f = 0.0791/(Re)^{1/4}. Calculate:
 i) Loss of height ii) Wall shear stress iii) Shear stress at 20mm from pipe wall.
- 14. a) Find the ratio of displacement thickness to momentum thickness and momentum thickness to energy thickness for the velocity distribution in the boundary layer given by $u/U = 2(y/\delta) (y/\delta)^2$.
 - b) A 2 m wide and 5.0 long plate when towed through water at 20^oC experiences a drag of 30.08 N on both sides. Determine the velocity of the plate and the length over which the boundary layer is laminar.

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- 15. a) Derive the equation in compressible flow for velocity of wave $C^2 = KRT$, form fundamentals.
 - b) Calculate the stagnation pressure, temperature and density on the stagnation point on the nose of a plane, which is flying at 800 kmph through still air having a pressure 8.0 N/cm^2 and temperature -10° C. Take R = 287 J/Kg and k = 1.4.
- 16. a) Write the properties of velocity potential function.
 - b) A pipe contain an oil of specific gravity 0.8. A differential manometer connected at the two points A and B of a pipe shows the difference in mercury levels as 20 cm. Find the difference of pressure at two points.

- 17. Write short notes on two of the following:
 - a) Reynolds experiment
 - b) Boundary layer controlling measures
 - c) Stagnation temperature.

That is the viscon's and derive Venton's law of viscosity.

- The velocity components in a 2D flow field for an incompressible fluid are on following to " y³/3 + 2x - x² y and y = xy³ - 2y - x³/3 obtain an expression for the stream (methon y)
 - 12 a) Explain differential U tube manometer with next aickels.
- b) In a smooth pipe of uniform diametre 25 cm, a pressure of 50 kPn was observed at about n 1 which was at eacuring 10.00 metres at mother section 2 at elevation 12.00 metres. The pressure was 20 kPa, velocity was 1.25 m/sec. Determine the cheotion of 10% and the head loss between these two sections. The finid in the pipe is oil of specific gravity, 0.89.
 - a) Derive Hagen Potseulles's equation for Liminar flew Unough circular nines.
- 3) A smooth pipe of diameter 60 and 1000 m long is carrying water at 8 little per second. If frieductic viscosity is 0.015 abolies for where and T = 0.0791.00e)¹⁰ Culculate 01 Loss of height 41 Wall about stress (ii) Show stress 4.0700 from dire wall.
- 14. a) Find the ratio of displacement theirness to momentum this cases and management their areas to enough this mass for the velocity distribution in the boundity taxes at by u/t = 20/5) - 0(6)²
- b) A 2 m wide and 5 0 long plate when lowed through water at 20°C experiences a dram of 30.68 IV on both sides. Determine the velocity of the plate and the length over which the boundary layer is justice.