Hall Ticket Number:

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 20^0C ------.
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 20^0C 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.

Contd...2

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^{0}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.

******