Code No. : 6165

FACULTY OF ENGINEERING
B.E. 2/4 (M/P) II Semester (Supple.) Examination, December 2009
FLUID DYNAMICS

Time: 3 Hours] [Max. Marks: 75

Note : *Answer* ***all*** *questions of Part A. Answer* ***five*** *questions from Part* ***B.***

PART – A **(25 Marks)**

1. Distinguish between solids, liquids and gases. 2
2. Enunciate Newton's law of viscosity distinguish between Newtonian and non-Newtonian fluids. 3
3. Sketch the velocity distribution for uniform irrotational flow in a pipe. 3
4. What are the limitations of the Bernoulli's equation ? 2
5. In determining the pressure distribution from the flow net, why is it necessary to distinguish between the steady and unsteady flow ? 3
6. What are the causes leading to separation of boundary layer ? 2
7. Enumerate distinguishing characteristics of laminar flow. 2
8. Explain what do you understand by wall turbulence and free turbulence. 3
9. Differentiate between isothermal and adiabatic process. 3
10. Define the Mach. angle and its importance. 2

PART – B **(50 Marks)**

11. a) Define the stream function. State and prove the properties of stream function. 4

    b) A thin flat plate of size 60 cm by 60 cm moves centrally between two large stationary boundaries the plane of the plate is parallel to the two boundaries which are 7 cm apart. The space between the plate and one boundary is filled with a fluid of viscosity twice that of another fluid which fills the space on the other side of the plate. If the plate moves with a uniform speed of 20 cm/s by the application of a force of 6N parallel to the plane of the plate, determine the fluid viscosities. 6

12. a) Derive Euler's equations of motion for one-dimensional flow of an inviscid, incompressible fluid. Integrate it to obtain Bernoulli's equation. 5

b) A 75 cm diameter uniform pipe bend turns the direction of flow of gasoline of sp. gr. 0.79 through an angle of 120° in the horizontal plane. The constant pressure and velocity through the bend one 90 KPa and 3 m/s respectively. Find the magnitude and direction of the force to be exerted on the bend to achieve the directional angle. 5

13. a) With a neat sketch explain the mechanism and principle of working of Bourden pressure gauge ? 5

b) The inlet and throat diameter of a venturimeter are 20 and 10 cm respectively. The differential mercury manometer connected to the inlet and throat points gives a reading of 25 cm. Determine the rate of flow the coefficient of discharge of the meter is 0.64. 5

14. a) Prove that the maximum velocity in a circular pipe for laminars flow is equal to twice the average velocity of flow. 5

b) What power is required per km of a pipe line to overcome the viscous resistance to the flow of glycorene through the horizontal pipe of diameter 100 mm at the rate of 10 *l*ps ? Take $\mu = 8$ poise, kinematic viscosity = 6.0 stokes. 5

15. a) What is a boundary layer ? Explain with a sketch the development of boundary layer over a smooth flat plate. 5

b) Determine the overturning movement at the base of an open air theatre screen 12 m wide and 7 m high due to a wind speed of 50 kmph. Assume air density = 1.21 kg/m^3 and $C_D = 1.4$. 5

16. a) Derive an expression for the velocity of propagation of a small pressure disturbances in a compressible fluid medium. 5

b) Air at stagnation in pressure of 10 atmosphere and stagnation temperature of 67°C is expanded adiabatically to a Mach number of 1.5. Calculate the pressure, density, temperature and velocity of fluid after expansion. 5

17. Write short notes on **any three** :

a) Micro manometer

b) Specific energy curve

c) Boundary layer thickness

d) Rotameter.