Code No. : 6017

FACULTY OF ENGINEERING
B.E. II/IV Year (Civil) II – Semester (Main) Examination, June 2010
FLUID MECHANICS – I

Time: 3 Hours] [Max. Marks: 75

Instruction : *Answer **all** questions of Part – A and **any five** questions from Part – **B**.*

PART A (Marks : 25)

1. Define a ideal fluid and real fluid. 2
2. Differentiate between simple manometer and differential manometer. 3
3. Name different type of forces on immersed body. 2
4. Define stream function and velocity potential function. 3
5. State Bernoulli's equation. How it is modified to real fluids ? 3
6. Define free vortex and forced vortex. 2
7. What is the basic principle on which venturi meter works ? 2
8. Differentiate between isentropic and adiabatic processes. 2
9. What is the significance of friction factor in pipe flow ? 3
10. Define critical velocity of flow in pipe flow. 3

PART – B (Marks : 50)

11. a) State and prove the Pascal's Hydrostatic law. 5

    b) For a two dimensional flow $\Phi = 3xy$ and $\psi = 3/2 (y^2 - x^2)$. Determine the velocity components at a points (1, 3) and (3, 3). Also find the discharge passing between the stream lines passing through the points given above. 5

12. a) State the Impulse-Momentum equation. How will you apply the momentum equation for determining the force exerted by a flowing liquid on a pipe bend ? 5

    b) A pipe of 300 m long has a slope of *1 in 100* and tapers from 1.20 m at higher end to 0.60 m diameter at the lower end. Quantity of water flowing is 5400 liter per minute. If the pressure at the higher end is 68.7 kPa, find the pressure at the lower end. Neglect losses. 5

13. a) Mention the uses of Pitot tube. Derive an expression to measuring the velocity of flow through a pipe. 5

b) A triangular notch is used to measure flow in a channel under a head of 0.20 m. If the discharge is to be measured with in 3% accuracy, what is the maximum velocity of approach that can be neglected. 5

14. a) Define Stagnation pressure and derive an expression for stagnation pressure of compressible fluid in terms of Mach number. 5

b) A test plane is described as having attained a flight speed of $M_a = 2$ at an altitude of 16 km where the temperature is approximately – 56.5°C (216.65 K). Assuming K = 1.4 and R = 287 J/kg. K. Determine the speed of the aero plane. 5

15. a) Explain the Reynold's Experiment with neat sketch. What is its significance in pipe flow ? 5

b) A pipe line 0.225 m in diameter and 1580 m long has a slope of *1 in 200* for first 790 m and *1 in 100* for the next 790 m. The pressure at upper end of the pipe line is 107.91kPa and at lower end is 53.955 kPa. Taking $f = 0.032$, determine the discharge through the pipe. 5

16. a) What do you understand by hydrodynamically smooth and rough pipes ? 5

b) Determine the diameter of a cast iron pipe which is required to carry water at 10°C at the rate of 250 litres per second if the loss of head is not to exceed 2 m per 100 m length of pipe. The average height of the pipe wall projection is 0.36 mm and kinematic viscosity of water at 10°C is 0.013 stokes. Assume f =0.032. Also determine mean velocity, Reynolds number and relative roughness. 5

17. Write short notes : $(4 \times 2^1/_2 = 10)$

e) Major and minor losses in pipe flow

f) Newton's law of viscosity and its applications

g) Convective and Local accelerations

h) Momentum correction factor.
