PVP 14

Code: CE3T6

II B.Tech-I Semester–Regular Examinations–December 2015

FLUID MECHANICS
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks
11x 2 = 22 M

1 a) What is kinematic viscosity? What are its units?
b) What is the difference between a piezometer and pressure gauge?
c) List the assumptions which are made while deriving Bernoulli's equations.
d) Define rotational and irrotational flows.
e) Define stream line and path line.
f) Define the terms hydraulic gradient line and total energy line.
g) Define Reynolds number and write the expression for the same.
h) Explain the principle of orifice meter.
i) Describe Magnus effect.
j) What are the advantages of triangular notch when compared to rectangular notch?
k) Under what conditions the centre of pressure and centre of gravity coincide with each other for a vertically immersed plane surface in the fluid.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks. 3 x 16 = 48 M

2 a) Differentiate between 8M

i) Absolute pressure and gauge pressure.

ii) Simple manometer and differential manometer.

iii) Weight density and specific volume.

b) Two coaxial cylinders 12cm and 11.80cm in diameter and 3.5cm high have both their ends open and have a viscous liquid filled in between. A torque of 1.3N.m is produced on the inner cylinder when the outer one rotates at 80RPM. Determine the coefficient of viscosity of the liquid. 8M

3 a) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow. 8M

b) A circular plate 2.5m in diameter is submerged in water such that its greatest and least depths below the free surface of water are 3m and 2m respectively. Find

i) Total pressure on front face of the plate and

ii) The position of center of pressure. 8M

4 a) A pipeline is 15 cm in diameter and is at an elevation of 100 m at section A. At section B, it is at an elevation of 107.0 m and has a diameter of 30 cm. When a discharge of

50 lit/sec of water is passed through this pipe, the pressure at section A is observed to be 30 kPa. The energy loss in the pipe is 2 m. Calculate the pressure at B when the flow is
i) from A to B, ii) from B to A 8 M

b) A laminar boundary layer is formed on 1m×1m smooth flat plate exposed to a fluid stream at zero incidence. If the drag on one side of the plate is 1.6N and the maximum boundary layer thickness is 1.25 cm, determine the shear stress at the trailing edge. 8 M

5 a) Derive the Darcy - Weisbach equation for friction head loss in a pipe. 8 M

b) Two parallel plates kept 100 mm apart have laminar flow of oil between them with a maximum velocity of 1.5 m/sec. Calculate discharge per metre width, shear stress at the plates and the difference in pressure between two points 20m apart. Assume viscosity of oil to be 24.5 poise. 8 M

6 a) Derive an equation for discharge of a rectangular notch.8 M

b) A venturimeter is installed in a pipeline carrying water and is 30cm in diameter. The throat diameter is 12.5cm. The pressure in pipeline is 140 KN/m^2 and the vacuum in the throat is 37.5 cm of mercury. 4% of the differential head is lost between the gauges. Working from first principle finds the rate of flow in the pipeline in lit/sec, assuming the venturimeter to be horizontal. 8 M