

[01 – 2210]

II/IV B.E. DEGREE EXAMINATION.

Second Semester

Civil Engineering

FLUID MECHANICS — I

(Common with Civil Environmental Engineering and
Dual Degree in Civil Engineering)

(Effective from the admitted batch of 2006–2007)

Time : Three hours

Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

Question No.1 are to be written in the
same sequence at one place only.

1. (a) What is difference between Buoyancy and Floatation?
- (b) What is vapour pressure? State its importance in pipe flow.
- (c) What is the difference between laminar flow and turbulent flow

7. (a) Explain Hardy-Cross method of analysis
- (b) A pipeline of 600 mm diameter is 1.5 km long. To increase the discharge another line of the same diameter is introduced parallel to the first in the second half of the length. If $f = 0.01$ and head at inlet is 300 mm, calculate the increase in discharge.
8. Write short notes on :
- (a) Laws of friction.
- (b) Stability of floating bodies.
- (c) Pitot tube.

- (d) What is special features of Cippoletti weir?
- (e) Write empirical formula for force exerted on a moving plate held inclined to the direction of Jet.
- (f) What is equivalent length of pipe?
- (g) What is function of Siphon?

2. (a) What are the physical properties of a fluid? Explain their practical significance.

(b) A circular plate 1.5 m diameter is submerged in water, with its greatest and least depths below the surface being 2 m and 0.75 m respectively. Determine

- (i) The total pressure on one face of the plate and
- (ii) The position of the centre of pressure.

3. (a) Discuss the various types of flows. Give practical examples for each.

(b) The streamlines are represented by

(i) $\psi = x^2 - y^2$

(ii) $\psi = x^2 + y^2$

(1) Determine the velocity and its direction at (2,2).

(2) Sketch the streamlines and show the direction of flow in each case.

4. (a) Explain the practical application of Bernoulli's equation.
- (b) A horizontal venturimeter with inlet diameter 200 mm and throat diameter 100 mm is employed to measure the flow of water. The reading of the differential manometer connected to the inlet is 180 mm of mercury. If the coefficient of discharge is 0.98, determine the rate of flow.
5. (a) What are the advantages of a triangular notch over a rectangular notch? What is velocity of approach?
- (b) A 3 m high tank standing on the ground is kept full of water. There is a small orifice in its vertical side with its centre at depth h metres below the free surface of liquid in the tank. Find the value of h so that liquid strikes the ground at the maximum distance from the tank. Assuming $C_v = 0.97$, calculate the maximum value of the horizontal distance.
6. (a) Derive an expression for the force exerted by a jet of water on a moving inclined plate in the direction of the jet.
- (b) In a 45° bend a rectangular air duct of 1 m^2 cross-sectional area is gradually reduced to 0.5 m^2 area. Find the magnitude and direction of force required to hold the duct in position if the velocity of flow at 1 m^2 section is 10 m/s and pressure is 30 kN/m^2 . Take the specific weight of air as 0.0116 kN/m^3 .