

- (iv) Difference between Absolute pressure and Gauge pressure.
- (v) What is Pitot-tube ?
- (vi) How are the weirs and notches classified ?
- (vii) Define an Orifice and a Mouthpiece.
- (viii) Difference between dynamic viscosity and kinematic viscosity.
- (ix) Define the terms 'path line and stream line'.
- (x) Define the terms 'model' and 'prototype'.

Roll No.

Total Pages : 04

July-22-00222

B. Tech. EXAMINATION, 2022

Semester III (CBCS)

MECHANICS OF FLUIDS-I

CE-302

Time : 3 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Sections A, B, C and D. Q. No. 9 is compulsory.

Section A

1. The dynamic viscosity of oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm. 10

2. (a) State and prove 'Pascal's Law'. 5
 (b) Explain the phenomena of capillarity. 5

Section B

3. The velocity components in a two-dimensional flow are :

$$u = 8x^2y - \frac{8}{3}y^3 \text{ and } v = -8xy^3 + \frac{8}{3}x^3.$$

Show that velocity components represent a possible case of irrotational flow. 10

4. A 300 mm diameter pipes carries water under a head of 20 meters with a velocity of 3.5 m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force at the bend. 10

Section C

5. Find the discharge through a trapezoidal notch which is 1 m wide at the top and 0.40 m at the bottom and is 30 cm is height. The head of water on the notch is 20 cm. Assume Cd for rectangular portion = 0.62, while for triangular portion = 0.60. 10

6. State Buckingham's π -theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis ? 10

Section D

7. Derive Darcy-Weisbach equation for head loss due to friction in a pipe. 10
8. A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take $f = .01$ for both sections of the pipe. 10

(Compulsory Question)

9. Answer the following : 10×2=20
- (i) Difference between liquid and gas.
- (ii) Name of different forces present in a fluid flow.
- (iii) What do you understand by Hydrostatic law ?