July-22-00280

B. Tech. EXAMINATION, 2022

Semester V (CBCS)

MECHANICS OF FLUIDS–II

CE-504

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 Section A, B, C and D. Q. No. 9 is compulsory.

Section A

1. An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 5 cm and of length 300 m. The rate of flow of fluid through the pipe is 3.5 litres/sec. Find the pressure drop in a length of 300 m and also the shear stress at the pipe wall. **10**

2. An oil of viscosity 12 poise flows between two parallel fixed plates which are kept at a distance of 5 cm apart. Find the rate of flow of oil between the plates if the drop of pressure in a length of 120 cm be 0.3 N/cm². The width of the plates is 20 cm. **10**

Section B

3. Determine the thickness of the boundary layer at the trailing edge of a smooth plate of length 4 m and width 1.5 m, when the plate is moving with a velocity of 4 m/sec in stationary air. Take kinematic viscosity of air 1.5×10^{-5} m²/sec. **10**

4. Obtain an expression for the boundary shear thickness in terms of momentum thickness. **10**

Section C

5. Drive an expression for the velocity distribution for the viscous flow through a circular pipe. Also sketch the velocity distributed and shear stress distribution across a section of the pipe. **10**

6. Find the bed slope of the trapezoidal of bed width 6 m depth of water 3 m and side slope of 3 horizontal to 4 vertical, when the discharge through the channel is 30 m³/sec. Take Chezy's constant, C = 70. **10**

Section D

7. Explain the construction, working and principle of Kaplan turbine with neat and clear diagram along with merits, demerits and applications. **10**

8. What is Hagen Poiseuille's formula ? Drive an expression for Hagen Poiseuille's formula. **10**

(Compulsory Question)

9. Short answer type questions :

   (a) Differentiate between velocity gradient and pressure gradient. **3**

   (b) Define viscous flow. **3**

   (c) Give the classification of pumps. **3**

   (d) Discuss the characteristics of Uniform flow. **3**

   (e) Define roughness coefficient. **3**

   (f) Discuss the specific force diagrams. **3**

   (g) Discuss the energy dissipation. **2**