

B.E/B.Tech Degree Examination, December 2020

Third Semester

**CE16302-Mechanics of Fluids**

(Regulation 2016 )

Time: Three hours

Maximum : 80 Marks

Answer ALL questions

**PART A - (8 X 2 = 16 marks)**

1. Calculate the kinematic viscosity (stoke) of the fluid, if the dynamic viscosity of fluid is 0.5 poise and specific gravity is 0.4?
  - a. 0.95
  - b. 1
  - c. 1.25
  - d. 1.5
  
2. Which one of the following is equal to 1 kilo Pascal?
  - a.1000 N/m<sup>2</sup>
  - b. 1000 N/cm<sup>2</sup>
  - c.1000 N/mm<sup>2</sup>
  - d.100 N/m<sup>2</sup>
  
3. 1 litre of water occupies a volume of
  - a.100 cm<sup>3</sup>
  - b.1 cm<sup>3</sup>
  - c.1000 cm<sup>3</sup>
  - d.0.1 cm<sup>3</sup>
  
4. Water is flowing in a horizontal pipe of cross sectional area 5 sq.cm is connected to a venturimeter of throat area 3 cm<sup>2</sup>.The manometer reading is equivalent to 5 cm of water Take  $g=1000 \text{ cm/s}^2$ .Find discharge in cm<sup>3</sup>/s
  - a. 375
  - b. 400
  - c. 450
  - d. 350
  
5. One litre of crude oil weighs 9.6 N.Calculate its specific weight and mass density.
6. The Diameter of pipe at the sections 1 and 2 are 15cm and 20 cm respectively. Find the discharge through the pipe if velocity of water is 4 m/s.
7. Which factor decides the type of flows in pipe?
8. Explain the term Dimensionless Numbers and List any two dimensionless numbers.

**PART B - (4 X16 = 64 marks)**

09. (a) The velocity distribution for the flow over a flat plate is given by  $u = 0.67y - y^2$ . In (16)  
which  $u$  is the velocity in metre per second at a distance  $y$  metre above the plate.  
Determine the velocity and shear stress at  $y = 0.10$  m and 0.2m. Take dynamic  
viscosity of fluid as 6 poise.

**(OR)**

- (b) Determine the total pressure and centre of pressure on an isosceles triangular plate of (16)  
base 5 m and altitude 5 m when the plate is immersed vertically in an oil of specific  
gravity 0.8. The base of the plate is 1m below the free surface of water.
10. (a) Water Flows through a pipe AB 1.2m diameter at 3m/s and then passes through a pipe (16)  
BC 1.5m diameter. At C pipe branches. Branch CD is 0.8m in diameter and carries one  
third of the flow in AB. The flow velocity in Branch CE is 2.5m/s. Find the volume  
rate of flow in AB, velocity in BC, Velocity in CD and diameter of CE.

**(OR)**

- (b) A orificemeter of diameter 15cm is inserted to a pipe of diameter 30cm is inserted in a (16)  
horizontal pipe. A differential mercury manometer is connected to inlet pipe and  
orifice gives a reading of 40cm of mercury. Find the discharge of oil Specific gravity  
 $S = 0.8$  through the pipe if Coefficient of discharge is 0.64.
11. (a) A pipeline of 0.6m diameter 1.5km long. To increase the discharge, another pipeline of (16)  
same diameter is introduced parallel to the first pipe line in the second half. Neglecting  
minor losses. Find the increase in discharge if  $4f = 0.04$ . The head at inlet is 30cm.

**(OR)**

- (b) A crude oil of viscosity 0.9 poise and specific gravity 0.8 is flowing through a (16)  
horizontal circular pipe of diameter 80mm and length 15m. Calculate the difference of  
pressure at the two ends of the pipe, if 50kg of oil is collected in a tank in 15 seconds.
12. (a) (i) A pipe of diameter 1.5m is required to transport an oil of specific gravity 0.9 and (8)  
viscosity 0.03 poise at the rate of 3000 litres/sec. Test were conducted on a 15cm  
diameter pipe using water at 20°C. Find the velocity and rate of flow in the  
model. Viscosity of water at 20°C = 0.01 poise
- (ii) Find the expression for the Power  $P$  developed by a pump when  $P$  depends upon (8)  
the head  $H$ , discharge  $Q$  and specific weight  $\gamma$  of the fluid.

**(OR)**

- (b) The velocity distribution in the boundary layer is given as (16)

$$\frac{u}{v} = \frac{3y}{2\delta} - \frac{1}{2} \left(\frac{y}{\delta}\right)^2$$

Compute displacement thickness and momentum thickness.