No. of Printed Pages : 4

BME-028

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

00073 **Term-End Examination**

June, 2018

BME-028 : FLUID MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of calculator is permitted.*

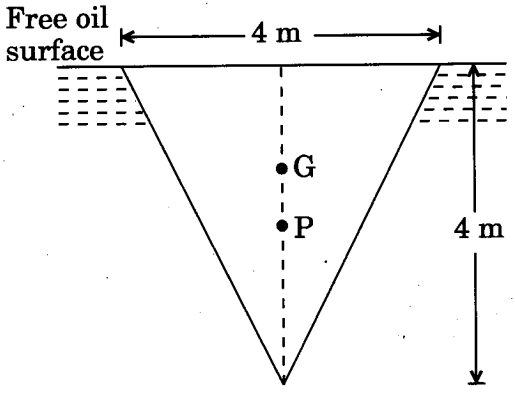
1. (a) State the advantages of mechanical pressure gauges over the manometers. 5

(b) Define the terms gauge pressure, vacuum pressure and absolute pressure. Indicate their relative positions on a chart. 4

(c) Prove that the pressure is same in all directions at a point in a static fluid. 5

2. (a) Derive an expression for the depth of centre of pressure from free surface of liquid of an inclined plane surface submerged in the liquid. 6

(b) Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4 m and altitude 4 m when it is immersed vertically in an oil of specific gravity 0·9. The base of the plate coincides with the free surface of oil. *8*



3. The inlet and throat diameters of a horizontal venturimeter are 30 cm and 10 cm respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13·734 N/cm^2, while the vacuum pressure head at the throat is 37 cm of mercury. Find the value of flow. Assume that 4% of the differential head is lost between the inlet and throat. Also find the value of C_d for the venturimeter. *14*

4. (a) Define the following coefficients : 6

(i) Coefficient of velocity

(ii) Coefficient of contraction

(iii) Coefficient of discharge

(b) A convergent-divergent mouthpiece having throat diameter 4·0 cm is discharging water under a constant head of 2·0 m. Determine the maximum outer diameter for maximum discharge. Also find the maximum discharge.

(Take H_a = 10·3 m of water and H_{sep} = 2·5 m of water absolute) 8

5. (a) What do you understand by turbulent flow ? What factor decides the type of flow in pipes ? 6

(b) Water is flowing through a rough pipe of diameter 500 mm and length 4000 m at the rate of 0·5 m^3/sec. Find the power required to maintain this flow. Take the average height of roughness as k = 0·40 mm. 8

6. (a) Define displacement thickness. Derive an expression for displacement thickness. 6

(b) Find the displacement thickness, the momentum thickness and the energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = y/\delta$; where u is the velocity at a distance y from the plate and u = U at y = δ, where δ = boundary layer thickness. Also calculate the value of δ^*/θ. *8*

7. The equation for specific speed for a turbine is given by $N_s = \frac{N\sqrt{P}}{H^{5/4}}$ by π-theorem and using variables such as power P, speed N, head H, diameter D for the turbine, density ρ of the fluid and acceleration due to gravity g, deduce the above expression for N_s. *14*

8. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Drag on Sphere

(b) Mouth Piece

(c) Continuity Equation

(d) Drag on Aerofoil

(e) Centre of Pressure and Centre of Buoyancy

(f) Turbulent Flow