Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2019 - 20 Examination

Semester: 3 **Date: 02/12/2019**
Subject Code: 203103207/03103202 **Time: 2.00 pm to 4.30 pm**
Subject Name: Fluid Mechanics/Fluid Flow Operation **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ) **(All are compulsory**) **(15)**
(Each of one mark)

1. f = 16/Re is true for _____ flow.
2. The Darcy-Weisbach equation is given as: _____.
3. Example of Thyxotropic fluid is _____.
4. The coefficient of discharge for a venturimeter lies within limit _____ to _____.
5. Define surface tension.
6. Elasticity of fluids is measured in terms of _____.
7. Write the expression of Bernoulli's Theorem: _____.
8. The average velocity of fluid in laminar flow is _____ of the maximum velocity.
9. The velocity potential is defined as: _____
_____.
10. What is local acceleration?
11. Which of the following is a mechanical gauge?
(a) Diaphragm gauge
(b) Dead weight pressure gauge
(c) Bourdon tube pressure gauge
(d) All of above
12. A Pitot tube is used for measuring:
(a) Flowrate
(b) Point velocity of flow
(c) Pressure of flow
(d) Total energy of flow
13. Shear stress in laminar flow through a pipe:
(a) Varies Parabolically across the cross section.
(b) Remains constant across the cross section.
(c) Is zero at the centre and varies linearly with the radius.
(d) Is zero at the wall and varies linearly towards the centre.
14. Mach number is the ratio of the speed of the:
(a) Fluid to that of the light.
(b) Light to that of the fluid.
(c) Fluid to that of the sound.
(d) Sound to that of the fluid.
15. Hydraulic radius is the ratio of
(a) Wetted perimeter to the flow area.
(b) Flow area to the wetter perimeter.
(c) Flow area to the square of the wetted perimeter.
(d) Square of flow area to the wetted perimeter.

Q.2 Answer the following questions. (Attempt any three) **(15)**

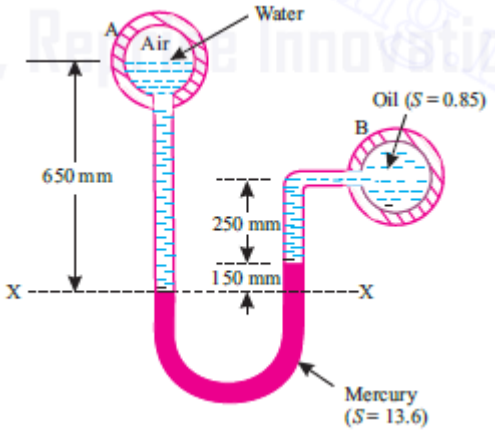
A) Explain the various types of fluids along with examples. Also draw their shear stress vs velocity gradient profile.

B) Calculate the capillary effect in millimeters in glass tube of 4mm diameter, when immersed in (i) water and (ii) mercury. The temperature of the liquid is 20 deg. C. and the values of surface tension of water and mercury at 20 deg. C in contact with air are: 0.0735 N/m and 0.51 N/m respectively. The contact angle for water is 0 degree, for mercury 130 degree. Take specific weight of water as 9790 $N/m^{3.}$

C) Find the velocity and acceleration at a point (1,2,3) after 1sec. for a three dimensional flow given

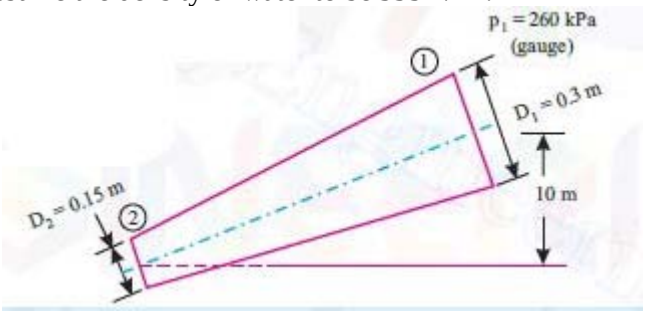
by: u = yz + t; v = xz – t; w = xy m/s.

D) The following figure shows a differential manometer connected at two points A and B. At A, the air pressure is 100 kN/m^2. Find the absolute pressure at B.



Q.3 A) Write down classification of turbulent motion. Also, derive Darcy-Weisbach formula for calculating the loss of head due to friction in a pipe. **(07)**

B) Water flows in a circular pipe. At one section the diameter is 0.3m, the static pressure head is 260 kN/m^2 gauge, the velocity is 3 m/s and the elevation is 10m above the ground level. The elevation at the section downstream is 0 m, and the pipe diameter is 0.15m. Find out the gauge pressure at the downstream section. Assume the density of water to be 999 k/m^3. **(08)**



OR

B) In a pipe of 300 mm diameter, the maximum velocity of flow is found to be 2 m/s. If the flow in the pipe is laminar, find: **(08)**

(i) The average velocity and the radius at which it occurs

(ii) The velocity at 50 mm from the wall of the pipe.

Q.4 A) A horizontal venturimeter with inlet and throat diameters 300 mm and 100 mm respectively is used to measure the flowrate of water. The pressure intensity at inlet is 130 kN/m^2 while the vacuum pressure head at the throat is 350 mm Hg. Find: **(07)**

(a) Coefficient of discharge for venturimeter

(b) Rate of flow

OR

A) What is a Venturimeter? Explain its types. Also, derive an expression for discharge. **(07)**

B) Derive the Hagen-Poiseuille equation. Also draw the shear-stress and velocity profiles. **(08)**