I D NO.	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 40 % Max Marks: 80 Max Time: 2 hrs. 11 May 2018, Friday

ENDTERM FINAL EXAMINATION MAY 2018

Even Semester 2017-18 Course: **CIV 208 Fluid Mechanics** IV Sem. Civil

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Instructions:

(i) Read the question properly and answer accordingly.

(ii) Question paper consists of 3 parts.

(iii) Scientific and Non-programmable calculators are permitted

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Part A

(6 Q x 5 M = 30 Marks)

1. Define the following dimensionless numbers and mention their significance in fluid flow problems: a) Reynold's number b) Froude's number
2. Describe with a neat sketch, the working of an orifice meter, indicate the reason of maximum flow velocity.
3. Differentiate between open channel flow and pipe flow, show the energy gradient line and the hydraulic gradient line in both cases.
4. What do you understand by the terms: Major energy loss and minor energy losses in pipes?
5. Show that in a rectangular channel:
   a) Critical depth is two – third of specific energy , and
   b) Froude Number at critical depth is unity.
6. State and explain Buckingham's PI theorem.

Part B

(3 Q x 10 M = 30 Marks)

7. Water at 5 ^{0}C (ρ = 1000 kg/m^{3} and μ = 1.519 X 10^{-3} kg/m.s is flowing steady through a 0.3 cm and 9 m long horizontal pipe at an average velocity of 0.9 m/s . Determine a) The head loss

b) The pressure drop

c) The pumping power requirement to overcome this pressure drop

8. A 6-cm-diameter horizontal water pipe expands gradually to a 9-cm-diameter pipe (Shown in Figure-1). The walls of the expansion section are angled 10° from the axis. The average velocity and pressure of water before the expansion section are 7 m/s and 150 kPa, respectively. Determine the head loss in the expansion section and the pressure in the larger diameter pipe.
9. Water flows in a channel whose bottom slope is 0.003 and whose cross section is shown in Figure-2. The dimensions and the Manning coefficients for the surfaces of different subsections are also given in the figure. Determine the flow rate through the channel and the effective Manning's coefficient for the channel.

Part C

(1 Q x 20 M = 20 Marks)

10. Water is to be transported at a rate of 2 m^3/sec in uniform flow in an open channel whose surfaces are asphalt lined. The bottom slope is 0.001. Determine the dimensions of the best economic section if the shape of the channel is
    a) Rectangular and b) Trapezoidal as shown in Figure-3

    Take manning's constant n = 0.016.

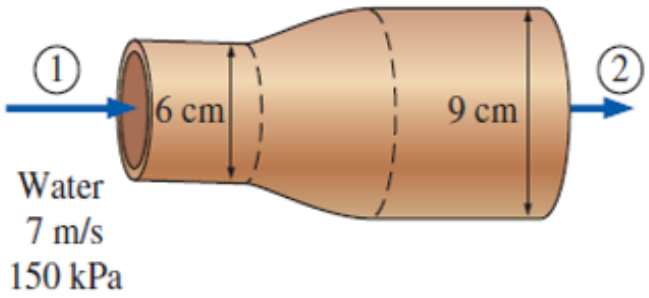
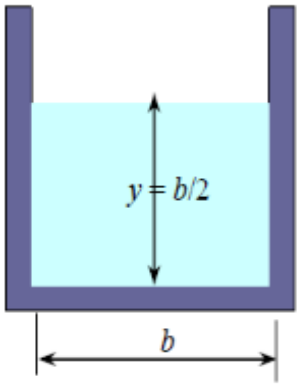


Figure-1



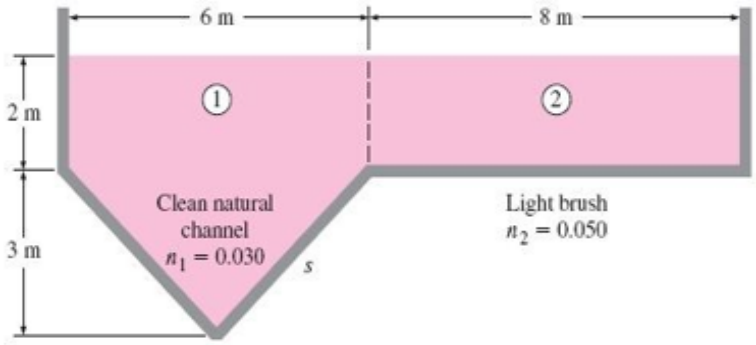


Figure-2

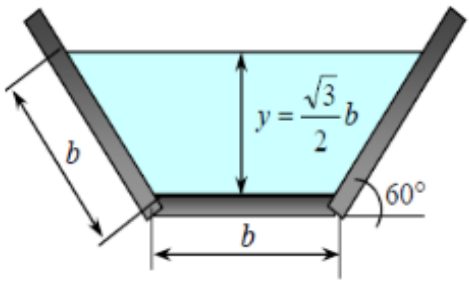


Figure-3

ID NO:	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20% Max Marks: 40 Max Time: 1 hr. 2 April Monday 2018

TEST – 2 **SET B**

Even Semester 2017-18 Course: **CIV 208 Fluid Mechanics** IV Sem. Civil

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Instruction:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted

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Part A

(4 Q x 5 M = 20 Marks)

1. A stone weighs 392.4 N in air and 196.2 N in water. Compute the volume of stone and its specific gravity.
2. Explain mass conservation law with respect to control volume and control mass.
3. State Bernoulli's theorem. What are the major assumptions made in derivation of Bernoulli's equation?
4. Define hydrostatic pressure and also mention important points about hydrostatic pressure.

Part B

(2 Q x 5 M = 10 Marks)

5. A large tank open to the atmosphere is filled with water to a height of 5 m from the outlet tap shown in Figure-1. A tap near the bottom of the tank is now opened, and water flows out from the smooth and rounded outlet. Determine the maximum water velocity at the outlet.
6. A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure (F) and position of Centre of pressure on the plane surface when its upper surface is horizontal and
   a) Coincides with water surface,
   b) 2.5 m below the free water surface.

Part C

(1Q x 10 M = 10 Marks)

7. A 1.2 m high, 0.9 m diameter cylindrical water tank whose top is open to the atmosphere is initially filled with water. Now the discharge plug near the bottom of the tank is pulled out, and a jet of water whose diameter is 1.3 cm streams out (Shown in Figure - 2). The average velocity of the jet is approximated as $V = \sqrt{2gh}$, where *h* is the height of water in the tank measured from the center of the hole (a variable) and *g* is the gravitational acceleration. Determine how long it will take for the water level in the tank
   a) Drop to 0.5 m from the bottom.
   b) Drop to 0.3 m from the bottom.

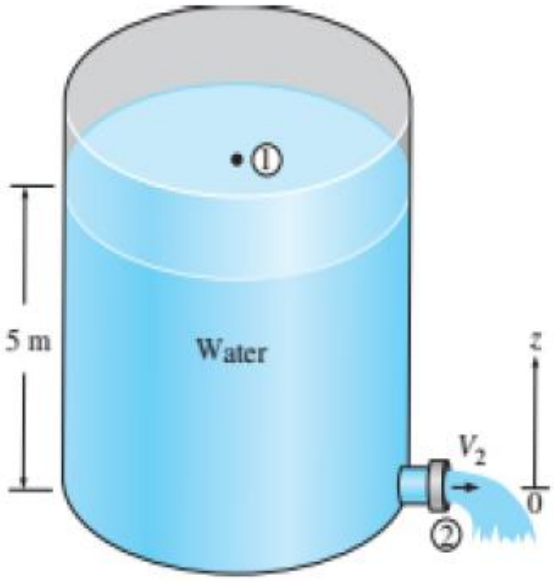

Figure-1

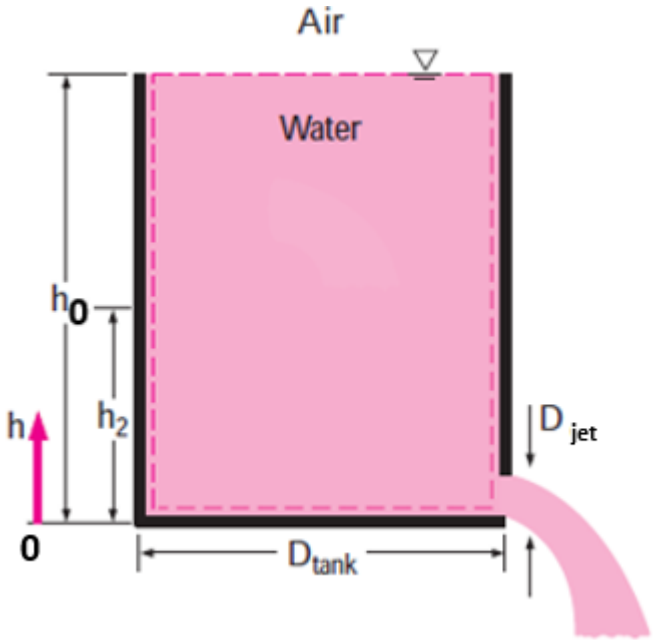

Figure-2

ID NO:	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20 % Max Marks: 40 Max Time: 1 hr. 23 Feb Friday 2018

TEST – 1

Even Semester 2017-18 Course: **CIV 208 Fluid Mechanics** IV Sem. **Civil**

Instruction:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted

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Part A

(4 Q x 5 M = 20 Marks)

1. Explain the effect of shear stress on solids and fluids.
2. Explain the phenomenon of surface tension with neat diagram.
3. Write the dimensions and SI units for following parameters
   a) Velocity b) Acceleration c) Force d) Pressure and e) Viscosity
4. Explain the relation between absolute pressure, atmospheric pressure and gauge pressure with neat diagram.

Part B

(2 Q x 5 M = 10 Marks)

5. A 0.6-mm-diameter glass tube is inserted into water at 20^{o}C in a cup as shown in Figure-1. Determine the capillary rise of water in the tube. Take surface tension of water at 20^{o}C is 0.073 N/m.

6. Consider a double - fluid manometer attached to an air pipe shown in Figure-2. If the specific gravity of one fluid is 13.55, determine the specific gravity of the other fluid for the indicated absolute pressure of air. Take atmosphere pressure to be 100 kPa.

Part C

(1Q x 10 M = 10 Marks)

7. A thin 30-cm X 30-cm flat plate is pulled at 1 m/s horizontally through a 3.6-mm-thick oil layer sandwiched between two plates, one stationary and the other moving at a constant velocity of 0.3 m/s, as shown in Figure-3. The dynamic viscosity of oil is 0.027 Pa - s.

   Assuming the velocity in each oil layer to vary linearly,

   (a) Plot the velocity profile and find the location where the oil velocity is zero and

   (b) Determine the force that needs to be applied on the plate to maintain this motion

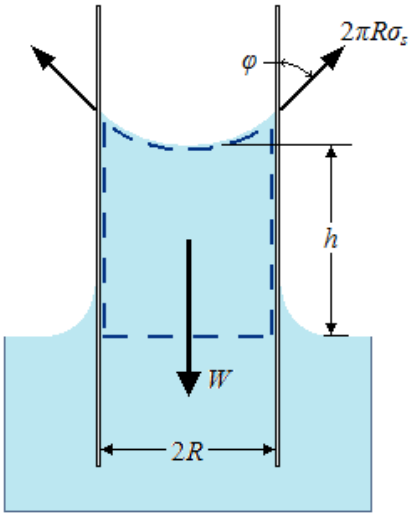

Figure-1

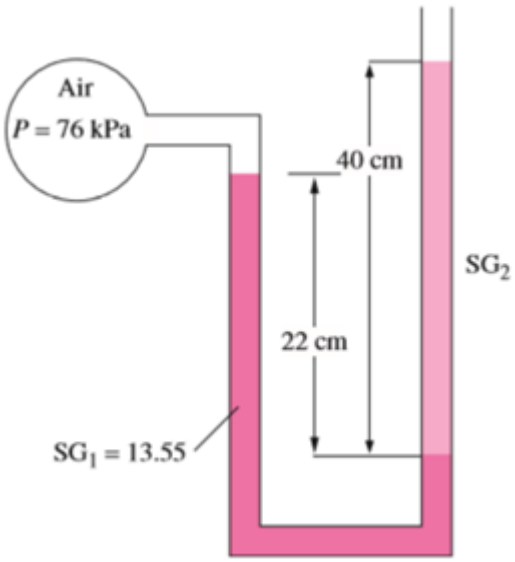

Figure-2

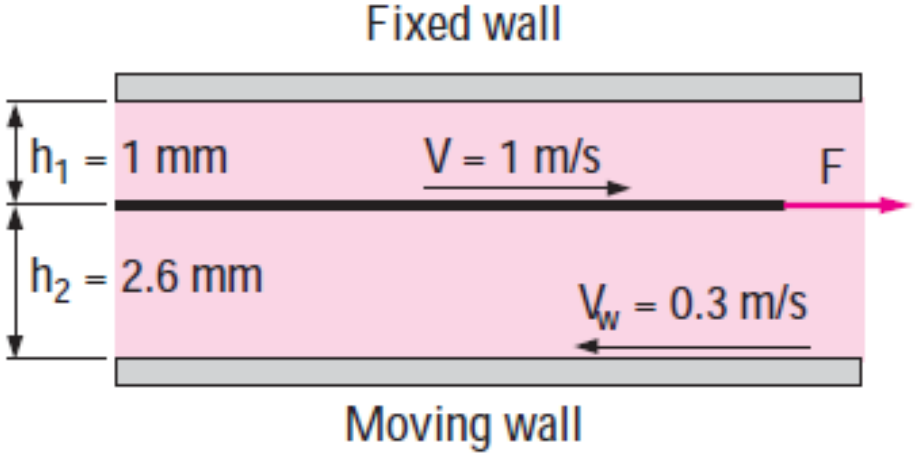

Figure-3