PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 100   Max Time: 180 Mins   Weightage: 50 %   **Set A**

COMPREHENSIVE EXAMINATION

I Semester 2016-2017   Course: **CE A 201 Transport Phenomena**   10 December 2016

Instructions:

  i.   Scientific and non-programmable calculators are permitted.
  ii. Closed book exam comprises parts A, B and C and open book exam involves only part D.
  iii. Separate answer booklet must be used for open book examination.
  iv. Only prescribed text book is permitted for open book examination.

Part A

Answer the following questions   (5 Q x 4 M= 20 Marks)

1. Write the dimensions and SI units for following parameters.
   a) Velocity b) Acceleration c) Force d) Pressure e) Viscosity and f) Relative density
2. Distinguish between uniform flow and non -uniform flow.
3. Distinguish between control mass and control volume.
4. Define the terms a) Total Energy Line (TEL) b) Hydraulic Gradient Line (HGL)
5. Explain the effect of shear stress on solids and fluids.

Part B

Answer the following questions   (3 Q x 10 M= 30 Marks)

1. Calculate dynamic viscosity of oil which is used for lubrication between a square plate of size 0.8 m X 0.78 m and an inclined plane with angle of inclination of 30^0 as shown in Fig-1. The weight of the square plate is 300 N it slides down the inclined plane with the uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm.
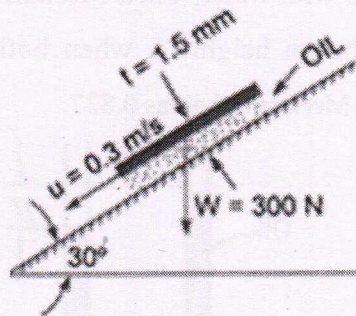

Fig-1

2. A body of dimensions 1.5 m X 1.0 m X 2.0 m, weighs 1962 N in water. Find its weight in air and its specific gravity?

3. A pipe, through which water is flowing, is having diameters 20 cm and 10 cm at the cross-sections 1 and 2 respectively. The velocity of water at section 1 is given as 4.0 m/s. Find the velocity head at sections 1 and 2 and also the rate of discharge.

Part C

Answer the following questions   (2 Q x 15 M= 30 Marks)

1. Derive the following equation of fluid statics.
   dp/dz = -ρg
2. A tank contains water up to a height of 0.5 m above base. An immiscible liquid of specific gravity 0.8 is filled on the top of water up to 1 m height. Find
   a) Total pressure on side of the tank
   b) Position of Centre of pressure for one side of tank which is 2 m wide.

Part D (Open book)

Answer the following questions   (2 Q x 10 M= 20 Marks)

1. The inclined-tube manometer as shown in Fig-2, has D = 96 mm and d = 8 mm. Determine the angle Θ, required to provide a 5:1 increase in liquid deflection L, compared with the total deflection in a regular U-tube manometer. Evaluate the sensitivity of this inclined-tube manometer and also find specific gravity of liquid.
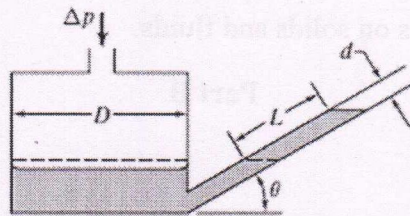
Fig-2

2. A manometer is formed from glass tubing with uniform inside diameter, D = 6.35 mm, as shown in Fig-3. The U-tube is partially filled with water. Then Meriam red oil of volume 3.25 cm^3 is added to the left side. Calculate the equilibrium height H, when both legs of the U- tube are open to the atmosphere. Take specific gravity of Meriam red oil as 0.827.
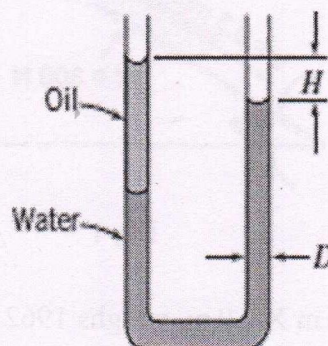
Fig-3

Max Marks: 50   Max Time: 50 Mins   Weightage: 25 %   **Set B**

TEST: 2

I Semester 2016-2017   Course: **CE A 201 Transport Phenomena**   18 November 2016

Instructions:

i.   Write legibly
ii. Scientific and non-programmable calculators are permitted

Part A

(4 Q x 4 M= 16 Marks)

1) State Archimedes' Principle
2) Distinguish between Pipe flow and open channel flow
3) Explain minor and major losses in a pipe?
4) State and explain Newton's second law with respect to Mass and Volume system

Part B

(1 Q x 10 M= 10 Marks)

1) A trapezoidal channel has a bed width of 2 m and side slope of 1.5 H: 1 V. The channel has longitudinal slope of 1 in 4000. If manning's roughness coefficient is 0.018, calculate mean velocity and discharge for a depth of 1.4 m.

Part C

(2 Q x 12 M= 24 Marks)

1) An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of oil of specific garvity 0.9 when the coefficient of discharge of the meter = 0.64. Take specific gravity of mercury = 13.6.

2) A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 15 cm respectively as shown in figure. If the average velocity in 30 cm diameter pipe is 2.5 m/s, find discharge in this pipe. Also determine the velocity in 15 cm diameter pipe if the average velocity in 20 cm diameter pipe is 2 m/s.
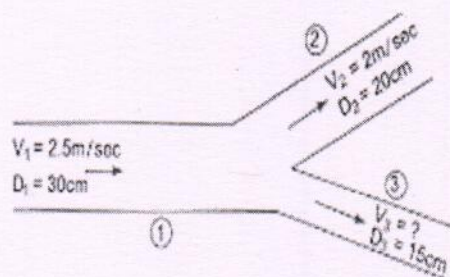
I Semester 2016-2017   Test 1   Course: **CE A 201: Transport Phenomena**
(Closed Book)

Max Marks: 30   Max Time: 50 Min   Weightage: 15 %   19 September 2016   **Set B**

Part A

### Answer the following question (3X4)

1. Explain the method of analysing multiple-liquid Monometer.
                                                                                3 M
2. Define following terms and also mention the units
    a) Dynamic viscosity   b) Kinematic viscosity.
                                                                                3 M
3. With neat diagrams show the distribution of hydrostatic pressure on horizontal, vertical and inclined planes.
                                                                                3 M
4. State all three Newton's laws of motion with example.
                                                                                3 M

Part B

Answer the following question (6 +12)

1. An inverted U-tube manometer is shown in figure. Determine the pressure difference between A   and B in N/M².
                                                                                6 M
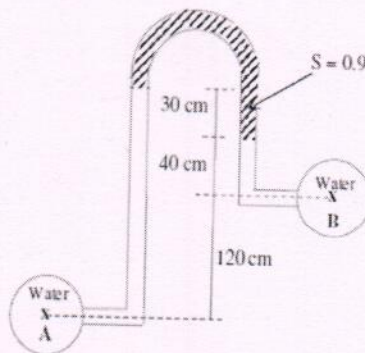
2. Determine the hydrostatic force acting on inclined plane which is submerged in water and also determine point of application of hydrostatic force.
                                                                                12 M

I Semester 2016-2017   Test 1   Course: **CE A 201: Transport Phenomena**
(Closed Book)

Max Marks: 30   Max Time: 50 Min   Weightage: 15 %   19 September 2016   **Set A**

Part A

Answer the following question (3X4)

1. Write the dimensions and SI units for following parameters.   3 M
   a) Velocity b) Acceleration c) Force d) Pressure E) Viscosity and F) Relative density

2. Explain the phenomenon of surface tension with neat diagram.   3 M
3. Explain the effect of shear stress on solids and fluids.   3 M
4. Define hydrostatic pressure and also mention important points about hydrostatic pressure.

       3 M

Part B

Answer the following question (8 +10)

1. A plate having an area of $1m^2$ is dragged down an inclined plane at 45^0 to horizontal with a velocity of 0.5m/s due to its own weight. There is a cushion of liquid 1mm thick between the inclined plane and the plate. If viscosity of oil is 0.1 Pa-s find the weight of the plate.   8 M

$y = 1 \text{ mm} = 1 \times 10^{-3} m$ Plate $U = 0.5$ m/s 45^0 W 45^0
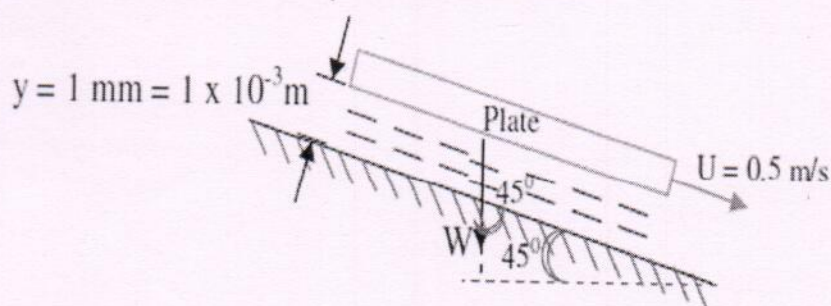
2. Derive the basic equation of fluid statics. I.e. prove that dp/dz = -ρg.   10 M