B.E. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING
SECOND YEAR, FIRST SEMESTER-2018

Subject: FLUID FLOW   **Time: 3 hrs**   **Full Marks: 100**

Use separate answer scripts for each group

Part-I   **40 marks**

Answer any two questions   **20×2 = 40**

1. (a) Convert a pressure head of 10 m of water column to kerosene of specific gravity 0.8 and carbon-tetra-chloride of specific gravity of 1.62.

    (b) Derive the basic equation of static pressure in a fluid.   8+12 = 20

2. (a) Briefly describe about different pressure measuring devices.

    (b) As shown in figure water flows through pipe A and B. The pressure difference of these two points is to be measured by multiple tube manometers. Oil with specific gravity 0.88 is in the upper portion of inverted U-tube and mercury in the bottom of both bends. Determine the pressure difference.   8+12 = 20
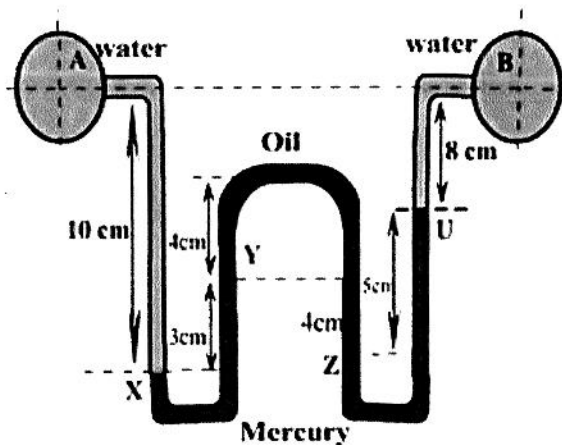
3. (a) A horizontal venturimeter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm2 and the vacuum pressure at the throat is 30cm of mercury. Find the discharge of water through venturimeter. Take Cd = 0.98.

   (b) Derive an expression for flow rate of a fluid through a orifice meter.   12+8 = 20

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BACHELOR OF ENGINEERING (F.T.B.E) EXAMINATION, 2018

(2nd Year -1st Semester , Supplementary)

FLUID FLOW

Time: 3 hrs.   Full Marks : 100

Part-II

[Answer any five questions, Full Marks 60]

1. What do you mean by laminar and turbulent flow ? What do you mean by 'power law' model equation? Show the profile of 'shear stresses against 'shear rate' for different types of fluids citing example for each. What do you mean by 'eddies'? What are the basic objectives of using pipe fittings. Mention the 'equivalent resistance value' of '90^0 elbow'and 'coupling'   (2+2+3+1+2+2)

2. In an air pipe line , the flow has the following conditions at section 1: temperature 25^{0}C, pressure 1.8 bar, velocity of flow 15 m/s, inside pipe diameter 50mm and at section 2: 25^{0}C, pressure 1.2 bar, inside pipe diameter 75mm. Calculate the mass flow rate of air and the velocity at section 2. At 25^{0}C and 1.8 bar pressure, air has density of 2.2 kg/m^3.   (12)

3. The velocity distribution with respect to radius of the flow pipe is a parabola for laminar flow of Newtonian flow through circular pipe-prove.   (12)

4. Determine the loss of pressure in overcoming the friction in a coil through which water flows with a velocity of 1.5 m/s. The coil is made of steel pipe with an internal diameter of 30mm. The diameter of a turn of the coil is 1 m. the number of turns is 10. The average temperature of the water in the coil is 30^{0}C. Assume here, density and viscosity of water as 998 kg/m^3 and 0.8 mPa-s.   (12)

5. What do you mean by 'porosity' in a packed bed? Develop a relation between pressure drop and length of packing material for flow with very low Reynolds no. (less than 10).   (2+10)

6. Advantages and disadvantages of 'fluidization' in industrial applications. Benzene at 20^{0}C (density = 900 kg/m^3 and viscosity = 6.0 x 10^{-4}Pa-s) is being pumped through 50 m of a straight pipe of 25 mm diameter with a velocity of 3 m/s. The line discharges into a tank 25 m above the pump. Calculate the pressure developed at the discharge side of the pump.   (2+10)

7. A water softener consists of a vertical tube of 30 mm diameter and packed to a height of 0.5 m with ion-exchange resin particles. May be considered spherical with a diameter of 1.2 mm. water flows over the bed , because of gravity as well as pressure difference , at a rate of 300 ml/s. The bed has a porosity of 0.3. Calculate the frictional pressure drop.   (12)