S.E(chem) - Sem III - CBSGS - F.F.

12 DEC 2014

Fluid Flow

QP Code :14687

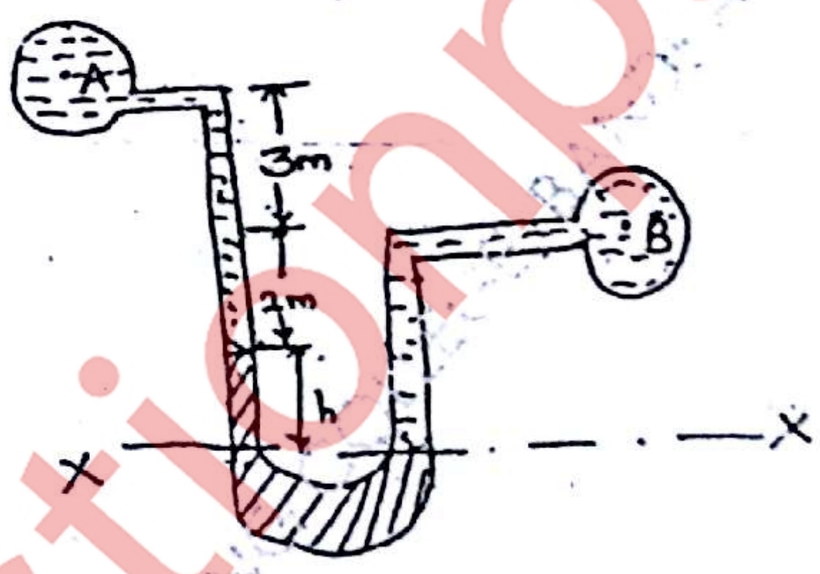
29

(3 Hours) **[Total Marks :80**

N.B. : (1) Q.No. **1** is **compulsory.**
(2) Attempt any **three** questions from remaining **five** question.
(2) Assume suitable **data if necessary.**

1. (a) Write short note on surface tension and capillarity effect. 5
   (b) Explain rheological behaviour of fluids with examples and shearstress Vs shear rate diagram, 5
   (c) Derive an expression for hydrostatic equilibrium 5
   (d) Draw neat sketches of any five type of agitators. 5

2. (a) A differential manometer is connected at the two points A & B of two pipes as shown in figure. The pipe A contains a liquid of sp.gr 1.5 while pipe B contains a liquid of specific gravity 0.9. The pressures at A & B are 1 kgf/cm² and 1.8 kgf/cm² respectively. Find the difference in mercury level in differential manometer. 8



   (b) Begining with Euler's equation derive Bernoulli's equation for adiabatic flow. 10

   (c) What is fully developed flow. 2

3. (a) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10cm is used to measure the flow of oil of sp.gr 0.8. The discharge of oil through venturimeter is 60lit/s. Find the reading of the oil-mercury differential manometer. Take Cd = 0.98. 8

   (b) Draw the characteristics curves (main and operating) for a centrifugal pump for head, capacity, power and efficiency. 6

(c) What do you mean by specific speed of a centrifugal pump ? Derive expression of specific speed for a pump. 6

4. (a) Calculate the stagnation pressure, temperature and density on the stagnation point on the nose of a plane, while is flying at 800km/hr through still air having pressure of 0.8kgf/cm² (abs) and temperature - 10°C. Take R = 287 J/kgK & K = 1.4. 10

(b) Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of pipe. 10

5. (a) Prove that the velocity of sound wave in a compressible fluid is given by $C = \sqrt{k/\rho}$ when k is bulk Modulus of fluid ρ = Density of fluid. 10

(b) A horizontal pipe line 40m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25m of its length from the tank, the pipe is 150mm diameter and its diameter is suddenly enlarged to 300mm. The height of water level in the tank is 8m above the centre of the pipe. Considering all losses of head which occur determine the rate of flow.
Take f = 0.01 for both sections of the pipe. 10

6. (a) Derive an equation for terminal setting velocity of spherical partical in fluid. 8
(b) Sketch the construction of Globe valve and Gate valve along with their function. 4
(c) A tapering pipe has a diameter of 25cm at point 1 (elevation 25m) and a diameter of 35cm at point 2 (elevation 20m) If the pressure at point 1 is 120KPa. Calculate the pressure at point 2 for a discharge of 0.2m³/s of water. The kinetic energy correction factor for section 1 and 2 are 1.1 and 1.5 respectively. The loss of head through a pipe can be assumed to be $1.2\frac{(V_1 - V_2)^2}{2g}$ flow is from section 1 to section 2. 8