Sub: Strength of materials.

. 2902-08. 2/5/08 CO-9838

(REVISED COURSE)

(3 Hours) [Total Marks : 100

1) Question No. 1 is compulsory.

Nk-Ex. 231 SE-C(Chemical) (Sem. IV) May 08.

Sub: Fluid flow

5/6/08

. 2914-08. CO-9829

(REVISED COURSE)

(3 Hours) [Total Marks : 100

1) Question No. 1 is **compulsory.**
2) Attempt any **four** questions out of remaining **six** questions.
3) Assume **suitable** data if **required** and indicate it **clearly.**
4) **Figures** to the **right** indicate marks.

5) An inverted U tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these pipes is 30 cm. When in oil of specific gravity 0·8 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective centre lines of the pipes) are found to be same and equal to 35 cm. Determine the difference of pressure between the pipes. 5

) Describe the use of friction factor chart. 5

) Derive an expression for velocity distribution for laminar flow through pipe. 5

) Write short note on Bourdon pressure gauge. 5

A crude oil of viscosity 0·9 pose and specific gravity 0·8 is flowing through a horizontal circular pipe of diameter 80 mm and length 15 m. Calculate the difference of pressure at the two ends of the pipe, if 50 kg of oil is collected in tank in 15 sec. 10

The rate of flow of water through a horizontal pipe is 0·3 m^3/sec. The diameter of the pipe is suddenly enlarged from 250 mm to 500 mm. The pressure intensity in the smaller pipe is 13·734 N/cm^2. 10

Determine :
(i) Toss of head due to sudden enlargement.
(ii) Pressure intensity in large pipe.
(iii) Power lost due to enlargement.

Derive the expression for hydrostatic equilibrium. 5

Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = 2\left[\frac{y}{\delta}\right] - \left[\frac{y}{\delta}\right]^2$. 10

Discuss the effect of roughness parameter on friction factor. 5

Define Newtonian and non Newtonian fluids. Describe the principle types of Behavior exhibited by these fluids using shear stress Vs. Velocity gradient plot. State examples for each types of flow. 10

A tapering pipe has a diameter of 25 cm at point 1 (elevation 25 m) and a diameter of 35 cm at point 2 (elevation 20 m). If the pressure at point 1 is 120 kPa, calculate the pressure at point 2 for a discharge of 0·20 m^3/sec of water. The kinetic energy correction factors for section 1 and 2 are 1·1 and 1·5 respectively. The loss of head through the pipe can be assumed to be $\frac{1 \cdot 2 (V_1 - V_2)^2}{2g}$. The flow is from section 1 to section 2. Take unit weight of water = 9790 N/m^3. 10

4. (a) Use Bender Schmidt method

$\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ given $u(0, t) = 0$, $u(4, t) = 0$ and $u(x, 0) = x(4 - x)$ assumin

Con. 2914-CO-9829-08.

5. (a) Draw the characteristic curves for a centrifugal pump for head, capacity, power a efficiency.
   (b) The internal and external diameters of the impeller of a centrifugal pump are 200 mm 400 mm respectively. The pump is running at 1200 r.p.m. The vane angles of the impe at inlet and outlet are 20° and 30° respectively. The water enters the impeller radi and velocity of flow is constant. Determine the work done by the impeller per unit we of water.
   (c) Write short note on Cavitation.
   (d) Write short note on Baker diagram.

6. (a) A venturimeter is to be installed in a 100 mm diameter pipeline to measure the flow water. The maximum flow rate is expected to be 73·8 m^3/hr. The 1·27 m manometer u to measure the differential pressure is to be filled with mercury and water is to be fi the leads about the mercury surface. What throat diameter should be specified for venturimeter and what will be power required to separate the meter at full load. Assu $C_d = 0{\cdot}98$.
   (b) Calculate the Pressure, temperature and density of air at stagnation point on the nos the plane, when an aeroplane is flying at 11000 km/hr through still air having a press of 7 N/cm^2 and temperature – 5°C. Wind velocity may be taken as zero. Take R = 287 J/kg°K, k = 1·4.

7. (a) Write short note on Power curves in mixing and agitation.
   (b) For a turbine agitator installed in a vertical tank speed is 1·5 r.p.s. Diameter of tan 1·8 m and the diameter of turbine is 0·6 m. The density of liquid is 1120 kg/m^3 and visco is $120\frac{Ns}{m^2}$. If the power Number is given by $N_p = \frac{65}{N_{Re}}$. Calculate the power requ for agitation.
   (c) State the application of draft tubes.
   (d) Define the term transition length. What is the transition length for a straight pipe with turbu flow.