SE – Sem III

Q. P. Code: 37802

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

CBCGS

Chem – FF

N. B.: (1) Question No. 1 is **Compulsory.**

(2) Attempt any **Three** questions out of remaining **Five** questions.

(3) Figures to the **right** indicate **full** marks.

(4) Make **suitable** assumptions wherever **necessary.**

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1. Answer the following sub questions [20]

(a) Explain an Inverted U- Tube manometer with its diagram.

(b) Define [1] Skin Friction [2] Form Friction

(c) Explain equivalent length and equivalent diameter

(d) What is the significance of Mach No.? Also define Mach No.

(e) Oil of viscosity 0.01 $kg_f sec/m^2$ and specific gravity of 0.9 flows through a horizontal pipe of 2.5 cm diameter. If the pressure drops per meter length of the pipe is 0.12 kg_f/cm^2. Determine (a) the rate of flow (b) NR_e

2. (a) The water is flowing through a tapering pipe having diameters 300 mm and 150 mm at section 1 and 2 respectively. The discharge through the pipe is 40 lit/sec. The section 1 is 10 cm above datum and section 2 is 6 m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 kN/m^2. [10]

(b) 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 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. [10]

3. (a) A gas is flowing through a horizontal pipe having area of cross section as 40 cm^2 where pressure is 40 N/cm^2 (gauge) and temperature 15^0C. At another section the area of cross section is 20 cm^2 and pressure is 30 N/cm^2 (gauge). If the mass rate of flow of gas through the pipe is 0.5 Kg/Sec, find the velocity of gas at these sections assuming an isothermal change. Take R=292 Nm/Kg K and atmospheric pressure = 10 N/cm^2 [10]

(b) What is swirling in agitated vessel? Why it is undesirable? Explain any two ways of preventing swirling? [10]

4. (a) Water is pumped from a lower reservoir by a pump that provides 20 KW of useful power to the water. The free surface of the upper reservoir is 45 m higher than the surface of the lower reservoir. If the flow rate of water is measured to be 0.03 m^3/s, determine the irreversible head loss of the system. Take density of water = 1000kg/m^3, assume efficiency =90% [10]

(b) What is mean by insertion meters? Give examples. Classify the flow measuring devices and write in brief about Venturimeter. [10]

5. (a) List the various types of valves used in chemical industry and explain in detail. [10]

(b) A horizontal pipe carries water at the rate of 0.04 m^3/s. Its diameter, which is 300 mm reduces abruptly to 150 mm. Calculate the pressure loss across the contraction. Take the co-efficient of contraction = 0.62. [10]

6. (a) The diameter of an impeller of a centrifugal pump at inlet and outlet are 30cm and 60cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30cm. [10]

(b) Oil of specific gravity 0.82 is pumped through a horizontal pipeline 150 mm in diameter and 3 km long at the rate of 0.015 m^3/s. The pump has an efficiency of 68% and requires 7.5 kW to pump the oil.

1. What is the dynamic viscosity of the oil? 2. Is the flow laminar? [10]
