SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | | Total number of pages:[3]

Total number of questions:06

B.Tech. || CHE || 3rd Sem

Fluid Flow

Subject Code: BTCH-303A

Paper ID:

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- **All questions are compulsory**
- **Assume any missing data**

PART A (2×10)

Q. 1. Short-Answer Questions: All COs

(a) Differentiate fluids from solids?

(b) Define reynold's number and what is its significance?

(c) What is a pitot tube?

(d) Define the term viscosity and explain the significance of the same.

(e) What is Mach number and give its significance.

(f) Differentiate between compressible and Incompressible flow with example.

(g) What are notches and weirs?

(h) Differentiate between laminar and turbulent flow.

(i) What are positive displacement pumps? Give examples.

(j) Differentiate fan, compressor and blower.

PART B (8×5)

Q 2 CO1

(a) A U-tube manometer is used to measure the pressure of water in a pipeline, which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of the water in the main line if the difference in level of mercury in the limbs of U-tube is 10 cm and the free surface of mercury is in level with the centre of the pipe.

(b) With a neat sketch explain the rheological diagram and explain the behavior of Newtonian and non-newtonian fluids.

OR

(a) What are manometers? Explain the principle, construction and working of U-tube manometer. CO1

(b) Define pressure. Obtain an expression for the pressure intensity at a point in a fluid.

45

Q 3 (a) What is Bernoulli equation? Derive with suitable assumptions. CO2

(b) Water is flowing through a pipe of 5 cm diameter under a pressure of 29.43 N/cm^2 (gauge) and with mean velocity of 2.0 m/s. Find the total head or total energy per unit weight of the water at a cross section, which is 5 m above the datum line.

OR

(a) Show for viscous flow through a circular pipe the velocity distribution across the section is parabolic. Show that the mean velocity is equal to one half the maximum velocity. CO2

(b) What is an orifice plate? Derive the equation for discharge measurement through a pipe with the help of an orifice plate.

Q 4 (a) Prove that the loss of pressure head for the viscous flow through a circular pipe is given by;- CO3

$$H_f = 32\mu ul/\rho gD$$

and establish f = 16/Re for laminar flow.

OR

(a) Derive an expression for the loss of head due to sudden contraction of a pipe CO3

(b) Water is flowing through a rough pipe of diameter 600mm at the rate of 500 liter/s. the wall roughness is 3 mm. find the power lost for 1000m length of pipe.

Q5 The pressure drop, Δp, for steady, incompressible viscous flow through a straight horizontal pipe depends on the pipe length, l, the average velocity, V, the fluid viscosity, μ, the pipe diameter, D, the fluid density, ρ, and the average "roughness height", e. Determine a set of dimensionless groups that can be used to correlate data. CO4

Or

The boundary-layer thickness, δ, on a smooth flat plate in an incompressible flow without pressure gradients depends on the freestream speed, U, the fluid density, ρ, the fluid viscosity, μ, and the distance from the leading edge of the plate, x. Using Buckingham - Π method, express these variables in dimensionless form.

Q 6 What are Head and Area meters? Describe the construction, working principles, range of operations and limitations of various types of meters. CO5

OR

(a) What do you mean by cavitation in pumps and what are the causes for cavitation? How cavitation can be avoided?

(b) Write a short note on the characteristic curves of centrifugal pumps.