

Scheme G
Sample Test Paper-I

Course Name : Diploma in Chemical Engineering

Course Code : CH

Semester : Fourth

Subject Title : Fluid Flow Operation

Marks : 25

17426

Time:1 hour

Instructions:

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

Q1. Attempt any THREE

9 Marks

- a) Define Kinematic viscosity and write its unit
- b) Write the formula to calculate Fanning's friction factor for laminar and turbulent flow.
- c) State the equation of continuity and write the formula.
- d) Define Compressible and incompressible fluid.

Q2. Attempt any TWO

8 Marks

- a) Draw the diagram of inclined leg manometer and write the expression to calculate the pressure drop.
- b) Calculate critical velocity, when water is flowing through a 25 cm id pipe. Viscosity of water is 0.0008 Pa.s.
- c) Differentiate laminar and turbulent flow on the following points:
 - (1) Nature of flow pattern
 - (2) Reynolds number

Q3. Attempt any TWO

8 Marks

- a) Write Hagenpoiseuille's equation and explain the terms involved.
- b) Give the significance of each term in Bernoulli's equation.
- c) Draw the graph showing the relationship between shear stress and shear rate for Newtonian and Non Newtonian fluids

Scheme G
Sample Test Paper-II

Course Name : Diploma in Chemical Engineering

Course Code : CH

Semester : Fourth

Subject Title : Fluid Flow Operation

Marks : 25

17426

Time: 1 hour

Instructions:

- 1 All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

Q1. Attempt any THREE

9 Marks

a)

Give the use of orifice meter and pitot tube.

- b) Give the equation for calculating volumetric flow rate using venturimeter and explain the terms involved in it.
- c) Give the names of three pipe fittings and state its uses.
- d) Explain the method of calibrating orifice meter.

Q2. Attempt any TWO

8 Marks

- a) Differentiate a fan, blower and compressor in terms of pressure they develop.
- b) Draw the diagram of a steam jet ejector and mark the parts.
- c) Why globe valve causes more pressure drop than gate valve?

Q3. Attempt any TWO

8 Marks

- a) Draw the diagram and state the application of (a) Tee (b) plug.
- b) What is NPSH? Give the formula to calculate it.
- c) Explain the construction of Rotameter.

Scheme G
Sample Question Paper

Course Name : Diploma in Chemical Engineering

Course Code : CH

Semester : Fourth

Subject Title : Fluid Flow Operation

Marks : 100

17426

Time: 3 hour

Instructions:

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

Q1A). Attempt any SIX

12 Marks

- a. Define absolute viscosity and write its unit in SI
- b. Define ideal fluid.
- c. State the significance of Reynold's number.
- d. Calculate friction factor when N_{Re} is 500?
- e. What is schedule number of pipe?
- f. Give the application of gear pump?
- g. List the application of steam jet ejector in chemical industry?

Q1.B) Attempt any TWO

8 Marks

- a. Write the formula to calculate average velocity from mass flow rate, when fluid is flowing through a pipe and explain the terms involved.
- b. Draw the diagram of (a) Ball valve (b) Non return valve.
- c. Differentiate between positive displacement pump and centrifugal pump based on the following points.
(a) Efficiency (b) mode of delivery (c) priming (d) pressure developed

Q2. Attempt any FOUR**16 Marks**

- Draw the diagram of well type manometer and write the expression to calculate the pressure drop.
- List the different types of friction and define each type.
- Draw the diagram of rupture disc and explain its working.
- What is cavitation? What are their effects on the pump?
- Write the equation for calculating the frictional loss due to sudden expansion and explain the terms involved.
- How will you calibrate a given orifice meter?

Q3. Attempt any FOUR**16 Marks**

- Derive the equation $P = \rho gh$, where the terms have usual meaning
- Differentiate between globe valve and gate valve based on
 - Application
 - pressure drop.
- Give classification of pumps.
- Give industrial applications of fan, blower and compressor.
- State Newton's law of viscosity. Give the mathematical expression.
- Draw the characteristics curve of centrifugal pump and explain it.

Q4. Attempt any FOUR**16 Marks**

- Draw the diagram and state the application of (a) bend (b) cross.
- Show that NRe is dimensionless.
- Explain the working of reciprocating compressor.
- Compare orifice meter and venturimeter based on the following points:
 - coefficient of discharge
 - pressure recovery
 - Pressure loss
 - power consumption
- A fluid is flowing through a 10cm diameter pipe at a velocity of 5 m/ s. Suddenly it enters a small pipe of diameter 5cm. Calculate the frictional loss due to sudden contraction of flow area.
- A simple U tube manometer is installed across a pipe line. The manometer fluid is mercury (specific gravity 13.6) and flowing fluid is CCl_4 (specific gravity 1.6). Manometer reads 200mm. What is the pressure difference over the manometer in N / m^2 ?

Q 5. Attempt any TWO**16 Marks**

- Fluid is to be pumped at a rate of $1.5m^3 / min$ through a 60mm id pipe 100 m long. Density of the fluid is $1050 kg / m^3$ and kinematic viscosity of the fluid is

$2.35 \times 10^{-6} \text{ m}^2 / \text{s}$. What is the pressure drop in the pipe?

b. Toluene is flowing at a rate of 10 liters / s through a 2 cm diameter pipe. Density of toluene is 870 kg/m^3 . Calculate

- (1) Volumetric flow rate in m^3 / s
- (2) Mass flow rate in kg / s
- (3) Average velocity in m / s
- (4) Mass velocity in $\text{kg/m}^2 \text{ s}$

c. Venturimeter is installed in a pipe line for the measurement of flow rate of water.

The pressure drop across the throat and upstream of the meter is 10 cm of mercury. Calculate the volumetric flow rate of water in m / s .

Data: Diameter of pipe is 25mm.

Diameter of throat is 15mm.

Coefficient of meter is 0.98.

Density of mercury is 13600 kg/ m^3 .

Q 6. Attempt any TWO

16 Marks

- a. With the help of a diagram, explain the working of single acting reciprocating pump.
- b. State and derive Bernoulli's equation.
- c. With the help of a diagram, explain the working of steam jet ejector.