VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA
Odd Mid Semester Examinationfor Academic Session 2025-26

SEMESTER: 3rd

COURSE NAME: B. Tech
BRANCH NAME: Chemical Engineering
SUBJECT NAME: Fluid Mechanics
TIME: **90 Minutes**

FULL MARKS: **30**

Answer **All** Questions.

The figures in the right hand margin indicate Marks. *Symbols carry usual meaning.*

[2 × 3]

Q1. Answer all Questions.

a) Why the viscosity of liquid decreases with increase in temperature? - CO1

b) A 30 cm diameter pipe conveying water, branches into 2 pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in the pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s. - CO2

c) Write down the expression of different types of minor losses in a pipe. - CO3

[8]

Q2. a) Write down the steps involved in dimensional analysis using Buckingham's-π theorem method. Discuss briefly about the selection of repeating variables. - CO1

b) (i) With a neat diagram, discuss briefly about different types of fluids with example.
(ii) With a neat diagram, discuss briefly about different types of pressure of a fluid.

OR

a) Show that the rate of increase of pressure in a vertical direction is equal to weight density of the fluid at that point. - CO1

b) Calculate the pressure due to a column of 0.3 of (a) water, (b) an oil of sp. gr. 0.8 and (c) mercury of sp. gr. 13.6.

[8]

Q3. a) Derive the expression for Bernoulli's theorem from Euler's equation of motion. - CO2

b) The water is flowing through a pipe having diameters 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Determine the difference in datum head if the rate of flow through the pipe is 40 liters/sec.

OR

a) Derive the expression of rate of flow of a fluid flowing through a venturimeter. - CO2

b) An oil of sp. gr. 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take Cd = 0.98.

[8]

Q4. a) A viscous fluid is flowing through a pipe of radius R. Derive the expression for - CO3

(i) Velocity distribution
(ii) Ratio of maximum velocity to Average velocity
(iii) Drop of Pressure for a given Length of a pipe

OR

a) Derive the expression for loss of head due to friction in pipe and expression for coefficient of friction in terms of shear stress when a fluid is flowing through a horizontal pipe of length L and diameter d. - CO3

$1\,cm = 10\,mm$ $\quad 1\,mm = \frac{1}{1000}\,m$ $\quad 1L = 10^{-3}\,m^3$

$\frac{P}{\rho} + \frac{v^2}{2} + gz = C$ $\quad \frac{P}{\rho g} + \frac{v^2}{2g} + z = C$ $\quad Q = A$

$1\,mm = \frac{1}{10}\,cm$ $\quad \rho = \frac{kg}{A\,dz}$ $\quad \frac{\partial v}{\partial t} = -\frac{1}{\rho}\frac{\partial P}{\partial s} \pm g\frac{dz}{ds}$