1T00533 - S.E.(Chemical Engineering)(SEM-III)(Choice Base Credit Grading System) (R- 19) (C Scheme) / 50723 - Fluid Flow Operations QP CODE: 10028859 DATE: 30/05/2023

(3 Hours) **(Total marks: 80)**

Notes: (1) Question No. 1 is compulsory.
(2) Attempt any three questions from questions nos. 2 to 6.
(3) Make suitable assumptions if required
(4) Figure to the right indicates full marks.

Q. 1 Answer any four questions (20)

a) Give the classification of pressure measuring devices.
b) Write the difference between Orifice meter and Venturi meter?
c) Explain any two properties of fluid with units.
d) Explain limitations on the use of Bernoulli's equation.
e) Derive equation of continuity.

Q. 2

(a) The space between two square flat parallel plates filled with oil. Each side of the plate is 720 mm. The thickness of the oil film is 15 mm. The upper plate which moves at 3 m/s requires a force of 120 N to maintain the speed.
Determine:
a) The dynamic viscosity of oil.
b) The kinematic viscosity of oil if the specific gravity of oil is 0.95. (10)

(b) Explain the different types of flows in detail. (10)

Q. 3

(a) Derive an expression for Bernoulli's equation, explain the each term in it and also state the assumptions made. (10)

(b) An oil of specific gravity 0.7 is flowing through the pipe of diameter 30 cm at the rate of 500 lit/sec. Find the head lost due to friction and power required to maintain the flow for a length of 1000 m. Take kinematic viscosity as 0.29 stokes. (10)

Q. 4

(a) Explain the construction and working of Orifice meter and Venturi meter. (10)

(b) Derive an expression for Hagen Poiseuille's equation. (10)

Q. 5

(a) A gas is flowing through a horizontal pipe of cross section area of 30 cm^2 at a point the pressure is 30 N/cm^2 and temperature is 20^0C. At another section, the area of cross section is 15 cm^2 and pressure is 25 N/cm^2. If the mass rate of flow of the gas is 0.15 kg/s, calculate the velocities at these two sections, assuming an isothermal change take R=287 J/kg.K and atmospheric pressure 10 N/cm^2. Both the pressures are the gauge pressure. (10)

(b) Derive an expression for velocity of sound for an adiabatic process. (10)

Q. 6

(a) What is Mach no.? Explain and give its significance. What do you mean by sonic, subsonic and supersonic flow? (05)

(b) What is NPSH; Differentiate NPSH and NPSHR. (05)

(c) Explain any two types of valves in detail. (10)