

18 NOV 2025 SE CHEMICAL SEM-III C SCHEME FFO QP CODE: 10093169

(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.

Q1 Solve any Four

- a) Determine the viscosity of a liquid having kinematic viscosity 6 stokes and specific gravity 1.6. (05)
- b) Water is flowing through a pipe 100 mm diameter under pressure of 19.62 N/cm^2 (gauge) and with mean velocity of 3 m/s. find the total head of the water at the cross-section, which is 8 m about datum line. (05)
- c) Define and give the significance of Mach Number (05)
- d) Write working principles of centrifugal pump and reciprocating pump. (05)
- e) What are major losses and minor energy losses in pipes. (05)

Q2

- a) Derive an expression for Bernoulli's Theorem from Euler's equation of motion. (10)
- b) Derive an expression for the discharge through Venturi meter (10)

Q3

- a) Sketch and write the construction of Globe valve and Gate valve along with their function (10)
- b) Find the Mach number when an aeroplane is flying at 1100 km/hour through still air having a pressure of 7 N/cm^2 and temperature -5°C , wind velocity may be taken as zero. Take $R = 287.14 \text{ J/kg. } ^\circ\text{K}$. Calculate the pressure temperature and density of air at stagnation point on the nose of the plane. Take $\gamma = 1.4$ (10)

Q4

- a) What is Hagen Poiseuille's formula? Derive an expression for Hagen Poiseuille's formula. (10)
- b) Find the head lost due to friction in a pipe of diameter 250 mm and length 60 m, through which water is flowing of 3 m/s using i) Darcy formula ii) Chezy's formula for which $C = 55$ take kinematic viscosity for water = 0.01 stoke (10)

Q5

- a) Derive an expression for the velocity distribution, shear stress distribution and relation between average velocity and maximum velocity for the laminar flow of fluid through the circular pipe. (10)
- b) What is cavitation Explain: i) Precautions against Cavitation. ii) Effects of Cavitation (10)

Q6

- a) Derive an expression for i) Hydrostatic Equilibrium ii) Pascal's law. (10)
- b) How are the manometers classified? Explain it in brief. (10)