(03 Hours) **[Total Marks: 80]**

N. B.: (1) Question No. **1** is **Compulsory.**

(2) Attempt any **Three** questions out of remaining **five** questions.

(3) Figures to the **right** indicate **full** marks.

(4) Make **suitable** assumptions wherever **necessary.**

---

1. Answer the following sub questions (Any **FIVE**) [20]

(a) Derive an expression for velocity distribution for laminar flow through pipe.

(b) Write note on Surface tension and Capillarity.

(c) Differentiate between Centrifugal and Reciprocating Pump.

(d) For a turbine agitator installed in a vertical tank speed is 1.5 RPS. Dia. of tank is 1.8 m and the dia. Of turbine is 0.6 m. The density of liquid is 1120 kg/m^3 and viscosity is 120 Ns/m^2. If the power number is given by Np=65/NRe. Cacultae the power required for agitation.

(e) Give and Explain the classification of Notches and Weirs.

(f) An oil of Sp.gr. 0.7 is flowing through a pipe of diameter 300 mm at the rate of 500 lit/s. Find the head lost due to friction and power required to maintain the flow for a length of 1000m. Take υ = 0.29 stokes.

2. (a) Write a Note on Vertical Single column Manometer. [05]

(b) An open tank contains water up to a depth of a 2m and above it an oil of Sp. Gr. 0.9 for a depth of 1 m. Find the pressure intensity [1] at the interface of the two liquids, and [2] at the bottom of the tank. [10]

(c) Differentiate between U-Tube and Inverted U-Tube differential Manometers. [05]

3. (a) A 300 x 150 mm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, flow being upward. The difference in elevation of the throat section and entrance section of the venturimeter is 300mm. The differential U-Tube mercury manometers shows a gauge deflection of 250 mm. Calculate: [1] The discharge of Oil, and [2] The pressure difference between the entrance section and the throat section. [10]

(b) Water is pumped from a lower reservoir to a higher reservoir by a pump that provides 20 KW of useful power to the water. The free surface of the upper reservoir is 45 m higher than the surface of the lower reservoir. If the flow rate of water is measured to be 0.03 m^3/s, determine the irreversible head loss of the system. Density 1000 kg/m^3. Efficiency 90% [10]

4. (a) A 120 mm diameter pipe reduces to 60 mm diameter through a sudden contraction. When it carries air at 25^0C under isothermal condition, the absolute pressures observed in the two pipes just before and after the contraction are 480 KN/m^2 and 384 KN/m^2 respectively. Determine: [1] Densities at the two sections [2] Velocities at the two sectionsTake R=287 Nm/Kg K [10]

   (b) Derive an expression for Bernoulli's Theorem from Eulers equation of motion. [10]

5. (a) A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the center of the pipe. Considering oil losses of head which occur, determine the rate of flow . Take f = 0.01 for both sections of the pipe. [10]

   (b) In connection with agitators give [1] Classification [2] Types of impellers and [3] Briefly explain about impellers. [10]

6. (a) A centrifugal pump delivers water. The speed of the pump is 1000 rpm. The velocity of flow at outlet is 3 m/s. The outlet vane angle is 30^0. Net head of the pump is 30 m. Power supplied to drive the pump is 90 KW. The width of impeller at oulet is 5 cm. The outlet diameter of impeller is 40 cm. Determine: [1] Volumetric flow rate of water through the pump [2] Work done by impeller per second [3] Overall efficiency of pump [10]

   (b) The head of water over an orifice of dia. 100 mm is 10 m. The water coming out from orifice is collected in a circular tank of dia. 1.5 m. The rise of water level in this tank is 1.0 m in 25 sec. Also the co-ordinates of a point on the jet, measured from vena-contracta are 4.3 m horizontal and 0.5 m vertical. Find the coefficients Cd, Cv. [10]