----(1)----

(3 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) Assume suitable data, if necessary.

1. Solve any **Five** (20)

   A. Explain variation of shear stress with velocity gradient.

   B. A fluid is flowing through a pipe of 40 cm diameter with average velocity of 4 m/s and the pressure of 30×10^4 N/m^2. Determine the total head. The potential head is 6 m. Density of fluid 1000 Kg/m^3.

   C. A small capillary with an inside diameter of 22.2×10^{-3} m and a length 0.317 m is being used to continuously measure the flow rate of a liquid having a density of 875 kg/m^3 and viscosity of 1.13×10^{-3} Pa.s. The pressure drop reading across the capillary during flow is 0.0655m water (density 996 Kg/m^3). What is the flow rate in m^3/s if end effect corrections are neglected?

   D. Distinguish between Venturimeter and Orifice meter.

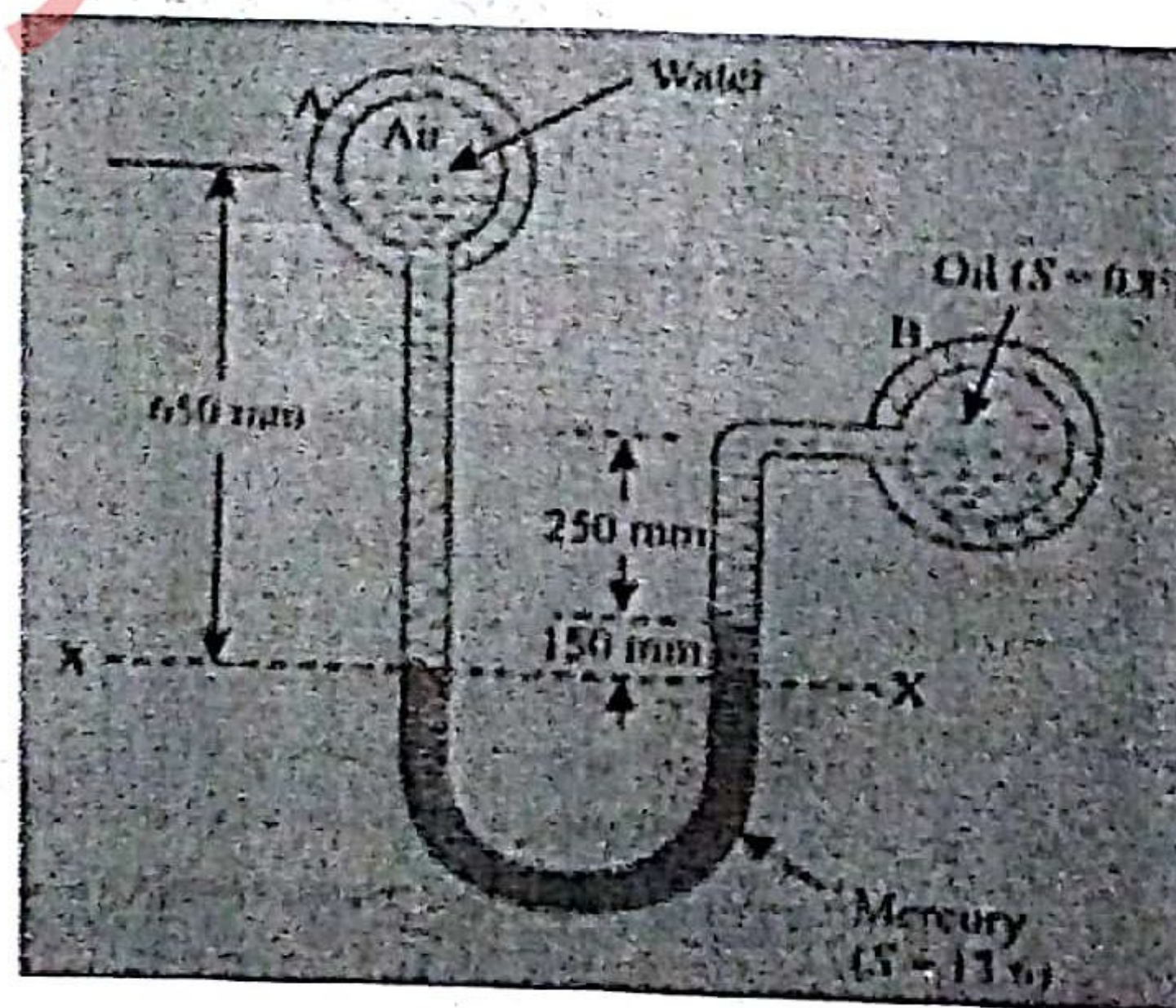   E. Explain the Flow patterns in Agitation?

   F. Define and explain following terms of Centrifugal Pump-

      1. Manometric Efficiency   2. Overall Efficiency   3. Mechanical Efficiency

2. A. Fig. shows a U- tube differential manometer is connected at the two points A and B of two pipes. The pipe A contains air pressure is 100 kN/m^2. Find the absolute pressure at B. (10)

[TURN OVER

R Determine the rate of flow of water through a pipe of 300 mm diameter placed in an inclined position where a Venturimeter is inserted, having a throat diameter of 150 mm. The difference of pressure between the main and throat is measured by a liquid of sp. Gravity 0.7 in an inverted U-tube which gives a reading of 260 mm. The loss of head between the main and throat is 0.3 times the kinetic head of the pipe. **(10)**

3. **A** A pipe line carrying oil of specific gravity 0.87 changes in diameter from 200 mm diameter at a position A to 500 mm diameter at a position B which is 4 m at a higher level. If the pressure at A and B are 1 kgf/cm^2 and 0.6 Kgf/cm^2 respectively and the discharge is 200 lit/sec. Determine the loss of head and direction of flow. **(10)**

B. Two pipes have a length L each. One of them has a diameter D, and the other a diameter d. If the pipes are arranged in parallel, the loss of head, when a total quantity of water Q flows through them is h, but, if the pipes are arranged in series and the same quantity Q flows through them, the loss of head is H. If d = D/2, Find the ratio of H to h, neglecting losses and assuming the pipe co-efficient f has a constant value. **(10)**

4. **A.** A centrifugal pump is used to deliver 0.35 m^3/s of a water through a pipe of 30 cm diameter and 80 m long. The water raised to a height of 30 m. The frictional losses in the pipe fittings is 1.5 m. Determine the work done per second by the pump? **(10)**

pump efficiency ~ 56%

B. What is Cavitation? Explain – 1. Precautions against Cavitation?

2. Effects of Cavitation? **(10)**

5. **A.** What is Swirling in agitated vessel? Why it is undesirable? Explain various methods for Prevention of swirling? **(10)**

B. oil of specific gravity 0.82 is pumped through a horizontal pipeline 150 mm in diameter and 3 km long at the rate of 0.015 m^3/s. The pump has an efficiency of 68% and requires 7.5 KW to pump the oil.

1. What is the dynamic viscosity of the oil? 2. Is the flow laminar? **(10)**

6. **A. Show that for laminar flow, V / u$_{max}$ = ½** Where, V is Average Velocity and u$_{max}$ is Maximum Velocity **(10)**

B A 120 mm diameter pipe reduces to 60 mm diameter through a sudden contraction. When it carries air at 25^{0}C 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 sections.

3. Mass rate of flow through the pipe **(10)**