(3) Assume suitable data if **required** and indicate it **clearly.**
(4) **Figures** to the **right** indicate marks.

1. (a) What do you mean the term 'fluid' ? And give the classification of fluids. **5**
   (b) Derive an expression for velocity distribution for laminar flow through pipe. **5**
   (c) Write short note on Pitot tube. **5**
   (d) Write short note on inclined tube manometer. **5**

2. (a) A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 15 cm resp. if the average velocity in the 30 cm diameter pipe is 2·5 m/sec, find the discharge in the pipe. Also determine the velocity in 15 cm pipe if the avg. velocity in 20 cm diameter pipe is 2 m/sec. **10**
   (b) Differentiate between incompressible and compressible fluids. **5**
   (c) Apply the 'Principle' of conservation of mean to the flow of incompresible fluids to derive the relevant form of continuity equation. **5**

3. (a) Discuss the Boundary layer development and calculate the momentum thickness, anergy thickness and displacement thickness for velocity Profile $\left(\frac{U}{V} = \frac{y}{\delta}\right)$. **10**
   (b) The rate of flow of water through a horizontal pipe is 0·3 m³/sec. The diameter of the pipe is suddenly enlarged from 250 mm to 500 mm. The Pressure intensity in the smaller pipe is 13·734 N/cm². Determine :– **10**
      (i) Loss of Head due to sudden enlargement
      (ii) Pressure intensity in large pipe
      (iii) Power lost due to enlargement.

4. (a) A gas is flowing through a horizontal pipe at a temp. of 4°C. The diameter of pipe is 8 cm and at a section (1) – (1) in the pipe, the pressure is 30·3 N/cm² (guage). The diameter of the pipe changes from 8 cm to 4 cm at the section (2) – (2), where pressure is 20·3 N/cm² (guage). Find the velocities of the gas at these sections assuming as Isothermal Process. Take R = 287·14 Nm/kg°K = 29·27 kgfm/kg°K and atmospheric pressure 10 N/cm². **10**
   (b) Find the mach Number when an aeroplane is flying at 11000 km/hr through still air having a pressure of 7 N/cm² and temp-5°C wind velocity may be taken as zero. Take R = 287·14s/kg°K. Calculate the pressure, temp., and density of air at stagnation point on the nose of the plane. Take R = 1·4. **10**

5. (a) List out different types of values used in industries along with their functions. **10**
   (b) Water is used to fluidized the spherical particle of density 2600 kg/m³. The height of the fluidized bed at minimum fluidization is 1·9 m. Take void fraction as 0·5 density of water = 1000 kg/m³. Determine Pressure drop across the fluidized column. **10**

6. (a) A venturimeter is to be installed in a 100 mm diameter pipe-line to measure the flow of water. The maximum flowrate is expected to be 73·8 m³/hr. The 1·27 m manometers used to measure the differential pressure is to be filled with mercury and water which is to filled with leads about the mercury surface. What throats diameter should be specified for the venturimeter and what will be power required to separate meter at full load. Assume c_d = 0·98. **10**
   (b) Differentiate between the operating principles of head flow meter and variable area flow meter. **10**

7. (a) Draw the characteristic curves for a centrifugal pump for head, capacity, power and efficiency. **10**
   (b) What is NPSH for pumps ? Derive general expression for its calculation. Differentiate between NPSH and NPSHR. **10**