N.B. 1. Q
2. Attempt any **four** questions out of remaining six q
3. Assume suitable data if **required** and indicate it **clearly.**
4. Figures to the **right** indicate marks.

1.a) Define Newtonian and non Newtonian fluids. Describe the principle types of Behavior exhibited by these fluids using shear stress vs. velocity gradient plot. State examples for each types of flow. **10**

b) What is meant by Head loss due to friction in pipe? What are the various types of Losses occurring in pipe? How it can be calculated? Express various empirical Formulas. **10**

2. a) For the Laminar flow of the fluid through a circular pipe, derive an expression for The Average velocity, maximum velocity, and friction factor also show the velocity Profile. **10**

b) Find the displacement thickness, momentum thickness, and energy thickness for the Velocity distribution in the boundary layer given by $U/U_S = Y/\delta$. **10**

3.a) Show by means of diagram the nature of propagation of disturbance in compressible Flow when the Mach number is less than one, is equal to one and is more than one. **10**

b) What is mean by insertion meters? Give example. Classify the flow measuring Devices and write in brief about venturimeter. **10**

4. a) Draw the characteristic curves for a centrifugal pump for head,capacity,power and Efficiency. **10**

b) In a centrifugal pump it is usual to to make the outside diameter to be twice the inner
Diameter, for this condition show that minimum diameter of an impeller which will Enable to pump water to ahead of H meter at a speed of N rpm at a man metric Efficiency of 0.70 is – **10**
$D = 81.7\ (H)^{1/2} / N$ meters

5 a) In connection with the Agitation give
Classifications of the types of impellers .and write briefly about them. **10**

b) Explain power curves for baffled and unbaffled vessel. **10**

6. a) Explain phenomena of Fluidization . **10**

6 b) what is minimum fluidization and Derive an expression for it. **10**

7 Write short notes on:-
a) Helical screw agitator
b) .inclined tube manometer
c) compressors classifications
d) neat sketches of different types of valves used in chemical plants. **20**