1. A hydrometer is used to measure the specific gravity of liquids. For a certain liquid a hydrometer reading indicates a specific gravity of 1.15. What is the liquids density and specific weight? Express your answer in SI units. (20%)

2. A conical plug is used to regulate the air flow from the pipe shown in Fig. 1. The air leaves the edge of the cone with a uniform thickness of 0.02 m. If viscous effects are negligible and the flowrate is 0.5 m^3/s, determine the pressure within the pipe. (30%)

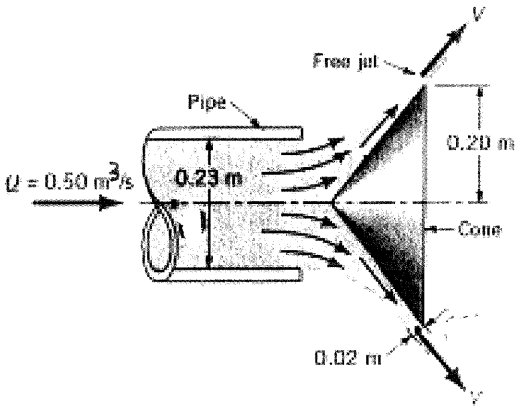

Figure 1

3. The pressure rise, △p, across a pump can be expressed as

$$\triangle p = f(D, \rho, \omega, Q)$$

Where D is the impeller diameter, ρ is the fluid density, ω is the rotational speed, and Q the flowrate. Determine a suitable set of dimensionless parameters. (25%)

4. The differential mercury manometer of Fig. 2 is connected to pipe A containing gasoline (SG=0.65) and to pipe B containing water. Determine the differential reading, h corresponding to a pressure in A of 20 kPa and a vacuum of 150 mm Hg in B. (25%)

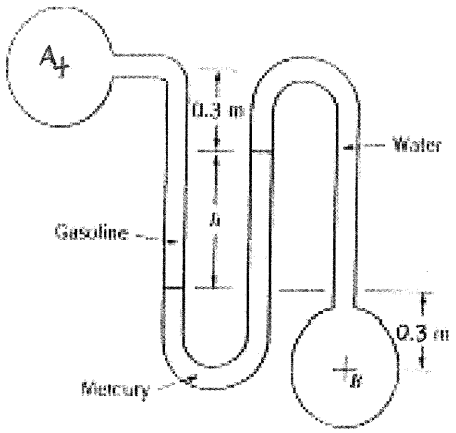

Figure 2