Pressure Measurement Homework

1. U-tube manometer is used to measure the pressure difference between two air tanks. Mercury is used as the measuring fluid and the level difference is measured at 63mm. Find the pressure difference in the tanks.

2. If water is used as the measuring fluid in problem 1, what would be the fluid level difference in the manometer?

3. A bellows type pressure transducer with k = 3600 N/m and effective area = 1 cm^2 is used to measure the absolute pressure in a tank of air. Find the deflection of the bellows from its relaxed state for a tank absolute pressure of 30 psi.

4. A homemade barometer contains some unknown fluid. The local atmospheric pressure is known to be 758mmHg and the homemade barometer is supporting a column of 58inches of the unknown fluid. Find the density of the unknown fluid in kg/m^3.

5. A Pitot tube is used to measure the velocity of air in a confined duct area. The differential pressure output of the Pitot tube is measured with a Freescale pressure sensor model MPVZ5004G. Determine the relationship between air speed and output voltage for this system. What is the range of air speed that can be measured? Assume the density of air ρ_{AIR} = 1.29 kg/m^3. Use the nominal values of all sensor parameters.

6. A Freescale MPX5100AP pressure sensor is used to make an altimeter for a model rocket. Assume the density of air ρ_{AIR} = 1.29 kg/m^3. Use the nominal values of all sensor parameters.

   a) What output voltage would be produced at ground level if the barometric pressure at ground level is 30.16 inches of mercury?

   b) What output voltage would then be produced when the rocket is at an altitude of 600 feet above ground level?