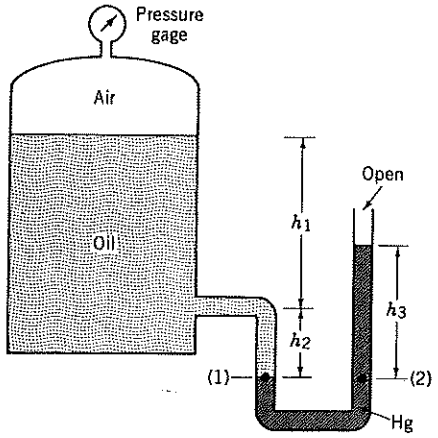
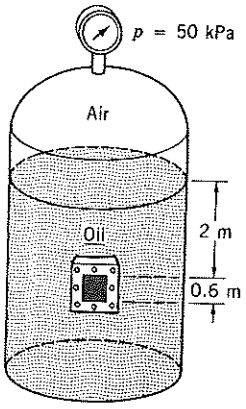
Assignment 2

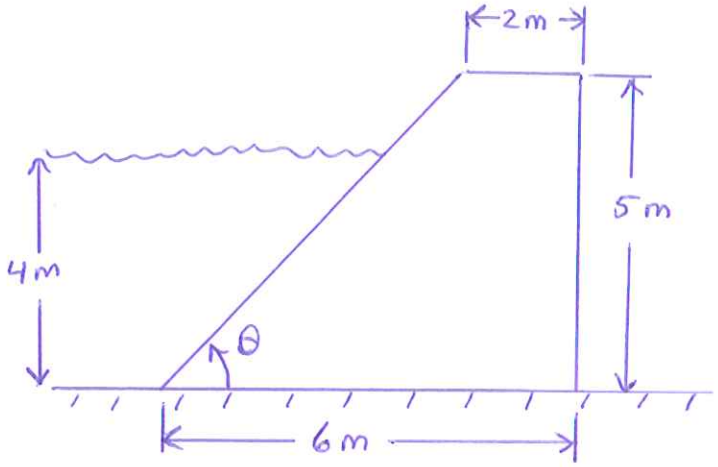
1. A closed tank contains compressed air and oil (specific gravity (SG) of oil = 0.90) as shown below. A U-tube manometer using mercury (SG_{Hg} = 13.6) is connected to the tank as shown. For column heights h_1 = 70 cm, h_2 = 10 cm and h_3 = 15 cm, determine the pressure reading in atmospheres and pascals of the gauge (A 0 reading represents a pressure of 1 atmosphere equal to the air pressure outside the tank.).



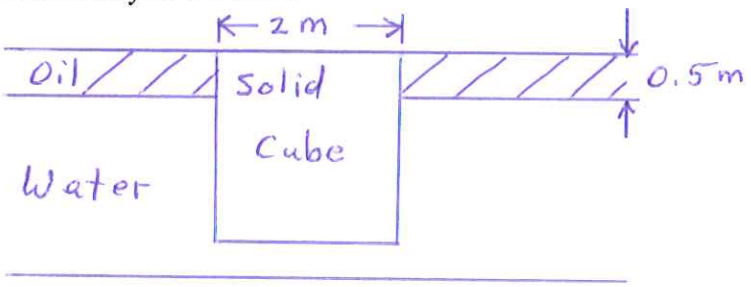
2. A pressurized tank contains oil (SG = 0.90) and has a square 60 cm by 60 cm plate bolted to its side as shown below. When the pressure gauge on the top of the tank reads 50 kPa, what is the magnitude of the force on the attached plate.



3. The concrete dam shown below weights 23.6 kN/m^3 and rests on a solid foundation. Determine the minimum coefficient of friction between the dam and the foundation required to keep the dam from sliding at the water depth shown. Assume no fluid uplift pressure along the base. Base your analysis on a unit length of the dam.



4. A solid cube floats in water with a 0.5 meter thick oil layer on top as shown below. Determine the density of the cube.



5. Air flows steadily from a tank through a hose of diameter D = 0.03 m and exits to the atmosphere from a nozzle of diameter d = 0.01 m as shown below. The pressure in the tank remains constant at 3 kPa and the atmospheric conditions are standard temperature and pressure. Determine the flowrate and the pressure in the hose.