Instructor: Dr. Afif Hasan   2nd semester 2011/2012

Note: Specific weight of water 9790 N/m3 = 62.4 lb$_f$/ft^3

Problem 1   (15%)

The hydraulic jack in figure 1 is filled with oil (s.g. = 0.90). Neglecting pistons weight, what force F required on handle to support 2000 lb$_f$ weight shown.

Problem 2   (55%)

Water depth behind a dam is 6 m; at the base of the-dam there is 2 m by 3 m exit tunnel as shown in figure 2. At end of a tunnel a quarter circle gate is hinged-at the center (pivot point) of the cylinder O.
   a. Calculate the horizontal force and its location on the gate [15]
   b. Calculate the vertical component on the gate [15]
   c. Determine the magnitude , direction and location of the resultant force on the gate (an angel and appoint that forces passes through).[10]
   d. What is the moment of resultant force about the pivot point.[5]
   e. What is the magnitude of the vertical force F to prevent gate from rotating, neglecting weight of gate? [10]

Problem 3   (30%)

A solid cylinder is 3 ft in diameter, 6 ft high and weighs 1550 lb$_f$. The cylinder is placed in oil (s.g. = 0.90) with its vertical axis as shown in figure 3.
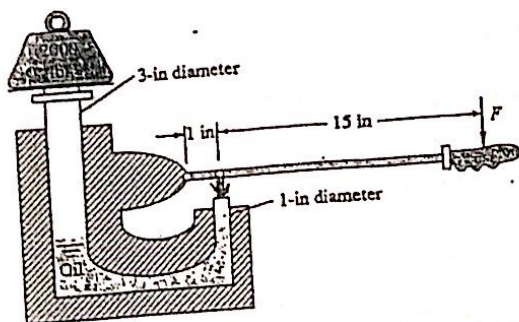   a. What is the submerged depth of cylinder? [10]
   b. Would the cylinder be stable? Explain why? [20]

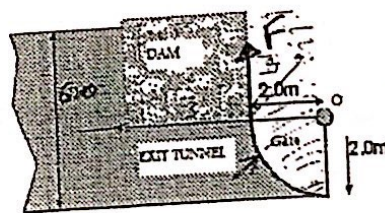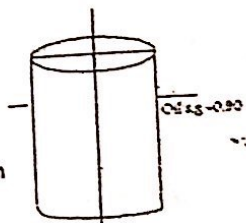Figure 1

Figure 2

Figure 3