CE 3305 – Fluid Mechanics Exam 1

1. Argon gas is used as a sheilding gas for welding for fabrication of metal objects. A 160-liter tank has an empty weight of 40 kg.

   Determine:

   (a) The total weight of the 160-liter tank of argon at a pressure of 3,500 psia at a temperature of 293^{o}K.

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2. A fixed mass of water has a bulk modulus of compressibility of 2.2×10^9 Pa.

   Determine:

   (a) The pressure increase (Δp) required to reduce the volume of a mass of water by 2-percent (2 %)

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3. The figure below is a schematic of a sliding plate viscometer used to measure the viscosity of a fluid. The top plate is moving to the right with a constant velocity of 10 meters per second in response to a force of 3 Newtons.

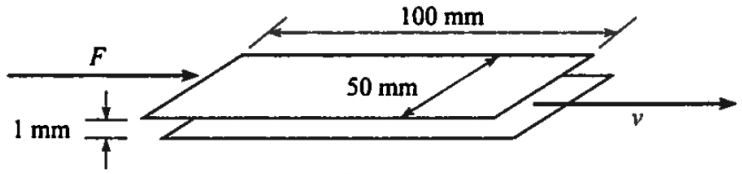

Figure 1:

   Determine:

   (a) The viscosity of the fluid between the plates.

4. A small spherical drop of water with diameter $d = 4\ mm$ and surface tension ($\sigma = 72.8 \times 10^{-3} \frac{N}{m}$) is depicted in the drawing below.

Figure 2:

Determine:

(a) The gage pressure of the water in the drop.

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5. A liquid with specific weight of 2700 N/m^3 is restrained by a circular gate as ahown.

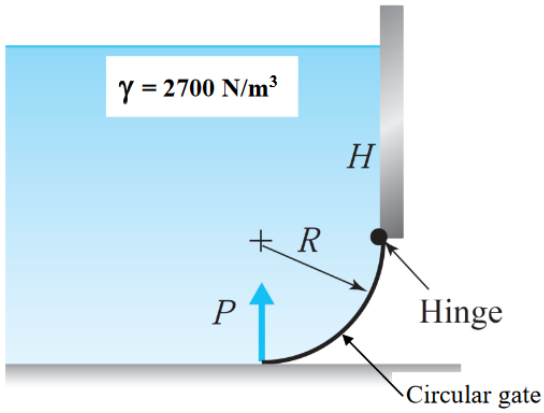

Figure 3:

The dimensions of interest are: R = 1.5 m, H = 6 m, Gate width (into the plane of the image) b = 3 m.

Determine:

(a) The liquid pressure at the hinge.

(b) The liquid pressure at the bottom of the gate

(c) The horizontal and vertical force of the liquid acting on the circular gate