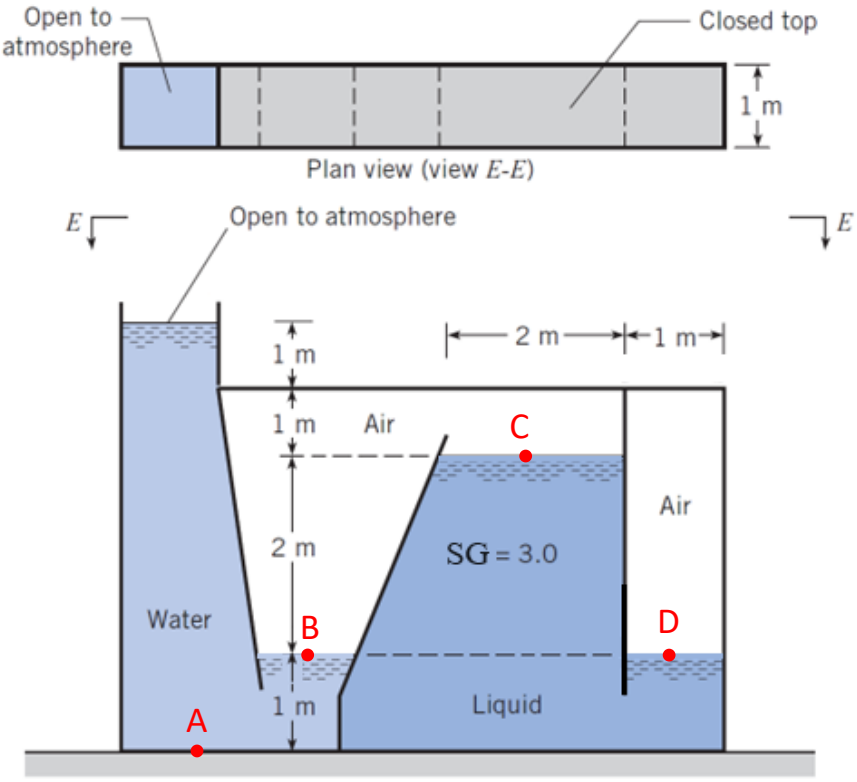
September 21, 2023

Mechanical, Automotive and Materials Engineering
Fluid Mechanics I
MECH3233-F23

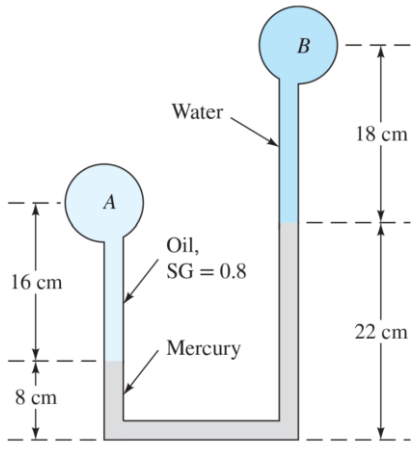
Assignment Problems Set #2

Due: Thursday, September 28, 2023, at 11:59 p.m.

Problem 1 (2 points): The tank with open and closed compartments contains water and immiscible liquid with SG = 3 as shown in the figure below. Calculate the **gage** pressures at points A, B, C and D. Assume density of water ρ = 998 kg/m^3.



Problem 2 (3 points): For the system shown below, compute the pressure difference P_A- P_B. Assume density of water ρ_w = 998 kg/m^3 and density of mercury ρ_{Hg} = 13550 kg/m^3.



Problem 3: The Martian atmosphere where g = 3.71 m/s^2 is almost entirely made up of carbon dioxide ($R_{CO_2} = 189 \frac{J}{kg.K}$). The average pressure on the surface of Mars is 700 Pa and the temperature drops off exponentially with altitude, *z*, as given below

$$T = T_0 e^{-Cz}$$

where C = 1.3×10^{-5} m $^{-1}$ and T_0 =250 K.

(a) (**3 points**) Determine the formula for the variation of pressure with altitude.
(b) (**3 points**) Find the altitude where pressure on Mars has dropped to 1 Pa.

Problem 4 (3 points): Determine the gage pressure at point A in Pa. Is it higher or lower than p_{atm}? Assume density of water ρ_w = 998 kg/m^3, density of mercury ρ_{Hg} = 13550 kg/m^3 and density of air ρ_{air} = 1.2 kg/m^3.