

Thermodynamics (MEL2020)
Indian Institute of Technology Jodhpur

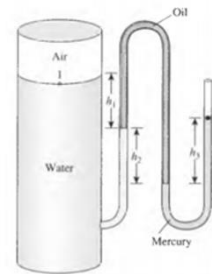
Tutorial-1

Date: 12th January 2022

Instructions:

- *Answer all the questions*
- *Please write your solutions/explanations on an A4 size paper with your own handwriting*
- *Scan all pages as a single pdf file and upload in google classroom before 8 PM same day*
- *This will give you **1 point** towards your total evaluation*
- *Late submission lead to deduction of **half mark**.*

1. Is the weight of a system an extensive or intensive property?
2. For a system to be in thermodynamic equilibrium, do the temperature and the pressure have to be the same everywhere?
3. What is a quasi-equilibrium process? What is its importance in engineering?
4. The water in a tank is pressurized by air, and the pressure is measured by a multi-fluid manometer as shown in figure given. Determine the gage pressure of air in the tank if $h_1 = 0.2$ m, $h_2 = 0.3$ m, and $h_3 = 0.46$ m. Take the densities of water, oil, and mercury to be 1000 kg/m^3 , 850 kg/m^3 , and $13,600 \text{ kg/m}^3$, respectively.



5. Consider an alcohol and a mercury thermometer that read exactly 0°C at the ice point and 100°C at the steam point. The distance between the two points is divided into 100 equal parts in both thermometers. Do you think these thermometers will give exactly the same reading at a temperature of, say, 60°C ? Explain.
6. A classroom that normally contains 40 people is to be air-conditioned with window air-conditioning units of 5-kW cooling capacity. A person at rest may be assumed to dissipate heat at a rate of about 360 kJ/h. There are 10 light bulbs in the room, each with a rating of 100 W. The rate of heat transfer to the classroom through the walls and the windows is estimated to be 15,000 kJ/h. If the room air is to be maintained at a constant temperature of 21°C , determine the number of window air-conditioning units required.