Thermodynamics (MEL2020)
Indian Institute of Technology Jodhpur

Tutorial-3 Date: 02nd February 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. Using the steam tables, complete this table for H_2O:

T, °C	P, Kpa	V, m^3/kg	Phase description
50		7.72	
	400		Saturated vapor
250	500		
120	5000		

2. Water initially at 300 kPa and 250°C is contained in a piston-cylinder device fitted with stops. The water is allowed to cool at constant pressure until it exists as a saturated vapor and the piston rests on the stops. Then the water continues to cool until the pressure is 100 kPa. On the T-v diagrams sketch, with respect to the saturation lines, the process curves passing through both the initial, intermediate, and final states of the water. Label the T, P and v values for end states on the process curves. Find the overall change in internal energy between the initial and final states per unit mass of water.

3. A piston-cylinder device contains 0.8 kg of steam at 300°C and 1 MPa. Steam is cooled at constant pressure until one-half of the mass condenses.
   A. Show the process on a T-v diagram.
   B. Find the final temperature.
   C. Determine the volume change.

4. A 0.3 m^3 rigid vessel initially contains saturated liquid-vapor mixture of water at 150°C. The water is now heated until it reaches the critical state. Determine the mass of the liquid water and the volume occupied by the liquid at the initial state.

5. A 4-L rigid tank contains 2 kg of saturated liquid-vapor mixture of water at 50°C. The water is now slowly heated until it exists in a single phase. At the final state, will the water be in the liquid phase or the vapor phase? What would your answer be if the volume of the tank were 400 L instead of 4 L?