Thermodynamics (MEL2020)
Indian Institute of Technology Jodhpur

Tutorial-11 Date: 13th April 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*
- *No late submission please! (zero marks for late submission)*

1. A Refrigerant-134a enters a steady-flow adiabatic compressor as a saturated vapor at 320 kPa and is compressed to 1200 kPa. The minimum power supplied to the compressor is found to be 100 kW.
   (a) Sketch the T-s diagram with respect to the saturation lines for this process.
   (b) Determine the volume flow rate of the refrigerant-134a at the compressor inlet, in m^3/s.

2. A heat engine that receives heat from a furnace at 1200 °C and rejects waste heat to a river at 20 °C has a thermal efficiency of 40 percent. Determine the second-law efficiency of this power plant

3. A house that is losing heat at a rate of 50,000 kJ/h when the outside temperature drops to 4°C is to be heated by electric resistance heaters. If the house is to be maintained at 25°C at all times, determine the reversible work input for this process and the irreversibility.

4. Refrigerant-134a enters an adiabatic compressor at -26 °C as a saturated vapor at a rate of 0.45 m 3/min and leaves at 800 kPa and 50°C. Determine *(a)* the power input to the compressor, (*b*) the isentropic efficiency of the compressor, and (c) the rate of exergy destruction and the second-law efficiency of the compressor. Take T_0 = 27°C.