

Thermodynamics (MEL2020)
Indian Institute of Technology Jodhpur

Tutorial-9

Date: 30th March 2022

Instructions:

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- *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)*
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1. A completely reversible heat pump produces heat at a rate of 300 kW to warm a house maintained at 24 °C. The exterior air, which is at 7 °C, serves as the source. Calculate the rate of entropy change of the two reservoirs and determine if this heat pump satisfies the second law according to the increase of entropy principle.
2. Steam is expanded in an isentropic turbine with a single inlet and outlet. At the inlet, the steam is at 2 MPa and 360 °C. The steam pressure at the outlet is 100 kPa. Calculate the work produced by this turbine, in kJ/kg.
3. Refrigerant-134a enters the coils of the evaporator of a refrigeration system as a saturated liquid-vapor mixture at a pressure of 160 kPa. The refrigerant absorbs 180 kJ of heat from the cooled space, which is maintained at -5°C, and leaves as saturated vapor at the same pressure. Determine (a) the entropy change of the refrigerant, (b) the entropy change of the cooled space, and (c) the total entropy change for this process.