

**Problem T3. (Unified Thermodynamics)**

Consider two quasi-static expansion processes, one adiabatic, the second isothermal for a closed system containing air at  $T_1 = 300\text{K}$ ,  $v_1 = 1 \text{ m}^3/\text{kg}$ . At the end of both expansion processes, the specific volume,  $v_2 = 10 \text{ m}^3/\text{kg}$ . Assume that  $c_p = 1.0035 \text{ kJ/kg-K}$ ,  $c_v = 0.7165 \text{ kJ/kg-K}$ , and  $R = 0.287 \text{ kJ/kg-K}$ .

- a) Sketch both processes on p-v and T-v diagrams.
- b) For each process determine  $p_2$  and  $T_2$ .
- c) For each process, determine the work done by the system and the heat transferred to the system.
- d) For each process calculate the change in enthalpy of the air.
- e) What is the difference between heat and temperature?

(LO#4, LO#5)