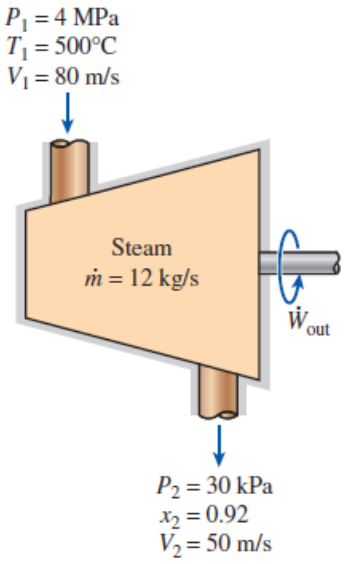
CANKAYA UNIVERSITY
FACULTY OF ENGINEERING AND ARCHITECTURE
MECHANICAL ENGINEERING DEPARTMENT
ME 211 THERMODYNAMICS I

FALL 2016

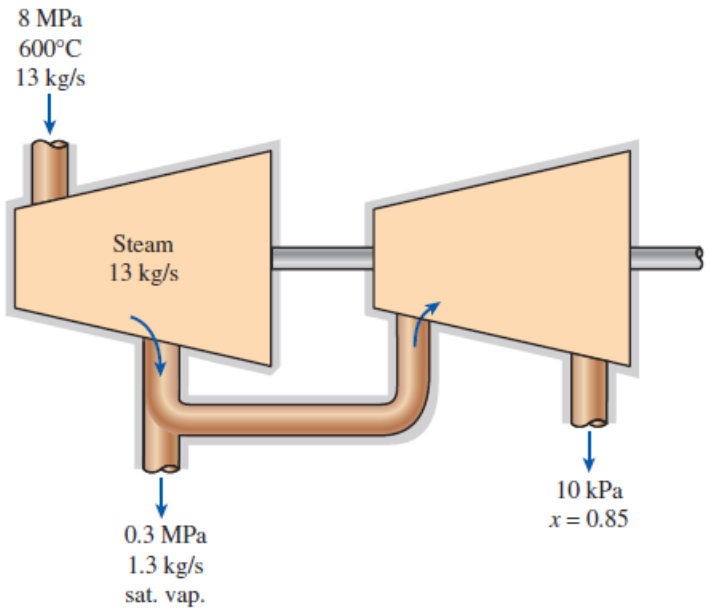
HW # 4

1) Refrigerant-134a enters an adiabatic compressor as saturated vapor at -24 ^{0}C and leaves at 0.8 MPa and 60 ^{0}C. The mass flow rate of the refrigerant is 1.2 kg/s. Determine (*a*) the power input to the compressor and (*b*) the volume flow rate of the refrigerant at the compressor inlet

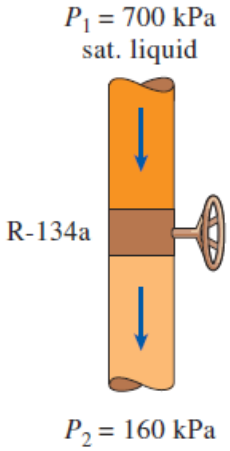
2) Steam flows steadily through an adiabatic turbine. The inlet conditions of the steam are 4 MPa, 5008C, and 80 m/s, and the exit conditions are 30 kPa, 92 percent quality, and 50 m/s.The mass flow rate of the steam is 12 kg/s. Determine (*a*) the change in kinetic energy, (*b*) the power output, and (*c*) the turbine inlet area.



3) Steam enters a steady-flow turbine with a mass flow rate of 13 kg/s at 600 ^{0}C, 8 MPa, and a negligible velocity. The steam expands in the turbine to a saturated vapor at 300 kPa where 10 percent of the steam is removed for some other use. The remainder of the steam continues to expand to the turbine exit where the pressure is 10 kPa and quality is 85 percent. If the turbine is adiabatic, determine the rate of work done by the steam during this process.



4) Refrigerant-134a is throttled from the saturated liquid state at 700 kPa to a pressure of 160 kPa. Determine the temperature drop during this process and the final specific volume of the refrigerant.



6)

An air-conditioning system is to be filled from a rigid container that initially contains 5 kg of liquid R-134a at 24 ^{0}C. The valve connecting this container to the air-conditioning

system is now opened until the mass in the container is 0.25 kg, at which time the valve is closed. During this time, only liquid R-134a flows from the container. Presuming that the process is isothermal while the valve is open, determine the final quality of the R-134a in the container and the total heat transfer.