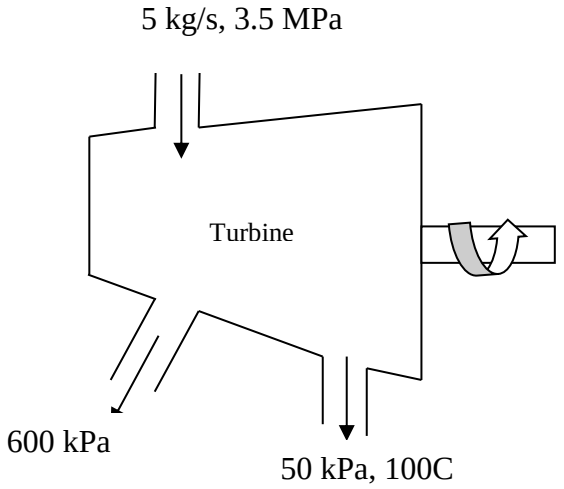
ABE – 201 Fall 2016

Homework 12

Due <u>Wednesday 11/02</u> at the beginning of class

1. (7.5 points) Steam passes through an adiabatic nozzle at a rate of 0.2 kg/s. The nozzle has a circular inlet that has a diameter of 5 m and a circular outlet that has a diameter of 2 m. The steam enters at 0.3 MPa and 200°C exits into a chamber 0.1 MPa pressure.
   a) What is the temperature and velocity of the exiting steam?
   b) How much entropy is generated by the nozzle?

2. (7.5 points) An isentropic steam turbine processes 5 kg/s of steam at 3.5 MPa, which is exhausted at 50 kPa and 100 C. Five percent of this flow is diverted for feedwater heating at 600 kPa. Determine the inlet steam temperature and power produced by this turbine, in kW.



3. (5 pts) Cold water at 15 ^{o}C enters a thin-walled, double-pipe, counter-flow heat exchanger at a rate of 0.25 kg/s and heated to 45 ^{o}C by hot water coming from a water heater at 100 ^{o}C and a rate of 3 kg/s. The heat exchanger is insulated well so the heat transfer between the exchanger and surroundings is negligible. Determine (a) the rate of heat transfer and (b) the rate of entropy generation in the heat exchanger.