ME 201
Thermodynamics
Exam 3

Directions: Open notes (including course web postings). No books, computers, or phones. Any calculator is fair game.

Problem 1
An inventor claims to have developed a device that has an inlet flow of air at 290 K, 300 kPa, and 5 kg/s and two outlet flows, air at 330 K and 270 kPa and air at 270 K and 270 kPa. He claims that there is no work or heat transfer involved in the device. Evaluate this claim. The temperature of the surroundings may be taken to be 298 K.

Problem 2
Two kilograms of Refrigerant-12 is contained in a piston-cylinder system. It is initially at 150 kPa and 0°C and is compressed to saturated vapor at 0°C. The heat transfer from the cylinder is reported to be 30 kJ. Can this value be correct? What is the minimum work input required to carry out this process? The temperature of the surroundings may be taken to be 298 K.

Problem 3
Determine the work per mass output of an adiabatic turbine with isentropic efficiency 0.83 that has a steam input of 15 MPa and 650°C and an outlet pressure of 325 kPa.