Problem 1:

Methane gas (CH_4) and oxygen enter a combustion chamber at standard conditions. The mass flow rate of the methane is 1 kg/s and the oxygen is 100 kg/s. Determine:

  (a) The adiabatic flame temperature using the average specific heat value at 500K.
  (b) The adiabatic flame temperature using the tables on pages 19-27 of supplemental handout.
  (c) The equivalence ratio, where equivalence ratio is defined as the actual fuel to oxidizer ratio divided by the stoichiometric fuel to oxidizer ratio.

Problem 2:

Consider the Rankine cycle drawn on the board. Suppose the net power output is 10 MW, and the condenser operating pressure is 10 kPa. Assume the water enters the condenser as a saturated vapor and leaves as a saturated liquid. The mass flow rate of steam is 10 kg/s. Neglect kinetic energy changes. Determine:

(a) the heat removed in the condenser.
(b) the thermal efficiency of the power plant.
(c) draw the cycle on an h-s diagram (assume ideal components).