

Homework Set #7, Thermodynamics II

Due:4-22-97

Methane gas enters a combustion chamber at the rate of 0.1 kg/s. Air enters at the rate of 2 kg/s. Calculate the mole fractions of each combustion product, as well as the dew point of the combustion gases. Also calculate the equivalence ratio and the air-to-fuel mass ratio.

In the foregoing problem, calculate the adiabatic flame temperature, the lower and higher heating value of the fuel, and the entropy generation rate for the combustion process.

In the foregoing problem, heat is transferred from the combustion chamber at a rate that is 20% of the fuel HHV. Calculate the exit temperature.

$$\text{kPa} \equiv 1000 \cdot \text{Pa}$$

$$\text{kmole} \equiv 1000 \cdot \text{mole}$$

$$\text{kJ} \equiv 1000 \cdot \text{joule}$$

$$R_u \equiv 8.314 \cdot \frac{\text{kJ}}{\text{kmole} \cdot \text{K}}$$