

Homework Set #8 Solution
Thermodynamics II
Due: 5-8-97

Nitrogen and oxygen air mixed together in a tank at 2 atm, 2000 K. After a long period of time, calculate the equilibrium concentrations of nitrogen, oxygen, and NO in the tank.

Repeat the first problem using StanJan.

Using StanJan, calculate the temperature and equilibrium concentrations of combustion products that leave a combustor. The reactants, methane and air, enter the combustor at 300 K. The mass air-to-fuel ratio is 20.

The products of combustion from the preceding problem enter a gas turbine engine, which has an isentropic efficiency of 85%. Calculate the exit temperature of the gases, as well as the work per kg of flowing gases produced by the turbine engine.

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

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

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

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