Chapter 5 Homework Exercises: Due 16 February

1. Text problem 1

2. A GE LMS100 STIG gas turbine is fired using natural gas and operates at ambient conditions of 30°C. Using data from Table 5.1 and Figures 5.13 and 5.14, estimate the flow rate of the natural gas to the turbine, in SCFM.

3. A GE LMS100PB gas turbine employs a two-stage compressor with an intercooler. Assuming that 1) the inlet air temperature is 300 K, 2) the intercooler cools the air leaving the low pressure compressor to 300 K, 3) the pressure ratio across each compressor stage is the same, i.e.,

\[ r_{P,1} = r_{P,2} = \sqrt{r_P} \]

where \( r_P \) is the overall pressure ratio for the cycle, and 4) the compressors and the turbine are isentropic, estimate, using a cycle analysis and the exhaust temperature given in Table 5.4, the cycle pressure ratio \( r_P \) and the combustor exit temperature. What would be the thermal efficiency of the cycle, as predicted from your analysis, and how does it compare to the thermal efficiency value listed in Table 5.4?

4. Prepare a 1–2 page profile on a company, of you choice, involved in a Stirling engine application. Your profile should include information such as the size and projected growth rate, the market for the product, the technological/engineering issues related to the product, and anything else you deem relevant. To get started, I would suggest you perform a Google search on "Stirling engine".