AE 234/711 Aircraft Propulsion
Quiz 5

1. An idealized reciprocating engine implementing the ideal Otto cycle operates with a compression ratio of 9:1 at intake conditions of 100 kPa and 298 K. The cylinder volume of 2000 cc. If 4 kJ of energy is transferred as heat to the working fluid during the isochoric process, calculate the cycle efficiency. Calculate the properties of the state at the end of each process.
   (1, 2, 298, 0) → (21.7, 0.22, 718, 0) → (93.7, 0.22, 3102, 1.05) → (4.3, 2, 1288, 1.05).
   Units are (bar, litres, K, kJ/kg-K)

2. What happens if the engine operated as an ideal diesel cycle with a compression ratio of 15:1? Calculate the properties at the end of each process.
   (1, 2, 298, 0) → (44.3, 0.13, 880, 0) → (44.3, 0.39, 2583, 1.08) → (4.5, 2, 874, 1.08).
   Units are (bar, litres, K, kJ/kg-K)

3. Compare the above two cases on $p - v$ and $T - s$ axes. Try to maintain accuracy qualitatively and quantitatively.

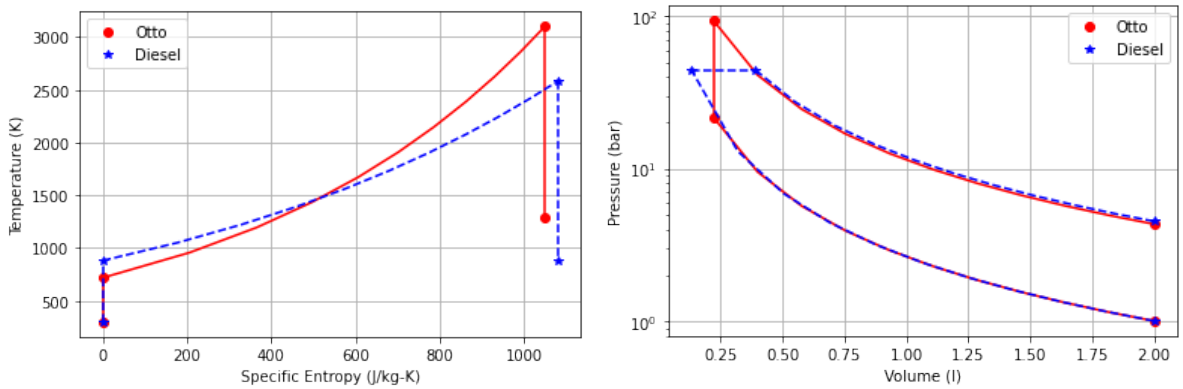

Figure 1: Comparing Otto and Diesel Cycles