

## IC Engine Cycle Thermodynamic Analysis

Perform a complete thermodynamic analysis for a four cylinder, four stroke 1.6 liter spark ignition engine operating with WOT (wide open throttle) at 3000 rpm.

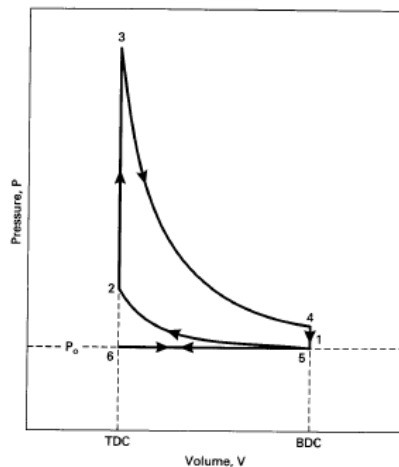
Engine data and operating conditions are given as;

- Engine bore to stroke ratio is 1.0.
- Compression ratio is 6:1
- Mechanical efficiency is 80 %
- Combustion efficiency is 96 %
- Fuel is iso-octane with a heating value of 44300 kJ/kg
- Air/Fuel ratio is 15:1
- At the beginning of the compression stroke conditions in the cylinder are 100 kPa and 60 °C

Assume that the engine runs on air-standard Otto cycle.

Calculate conditions (Temperature and pressure) at state (1), (2), (3) and (4) in **Figure 1**.

- Calculate
- (i) thermal efficiency,
  - (ii) indicated and brake power output at 3000 rpm,
  - (iii) engine torque at 3000 rpm.



**Figure 1.** Air standard Otto cycle representing four-stroke SI engine.