

Course : Applied Thermal Engineering (UMT303)

Batch: B.E. Mechatronics (2nd yr.)

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Tutorial No. 10

Topic: Air Standard Cycle

Q1. An ideal Otto cycle has a compression ratio of 8. At the beginning of the compression process, air is at 100 kPa and 17°C, and 800 kJ/kg of heat is transferred to air during the constant-volume heat-addition process. Accounting for the variation of specific heats of air with temperature, determine

- (a) the maximum temperature and pressure that occur during the cycle,
- (b) the net work output,
- (c) the thermal efficiency, and
- (d) the mean effective pressure for the cycle.

[Ans. 1575K, 43.45bar, 418.17kJ/kg, 52.3%, 5.74bar]

Q2. At the beginning of the compression process of an air-standard Diesel cycle operating with a compression ratio of 18, the temperature is 300 K and the pressure is 0.1 MPa. The cut-off ratio for the cycle is 2. Determine

- (a) the maximum temperature and pressure that occur during the cycle,
- (b) the thermal efficiency,
- (c) the mean effective pressure for the cycle.

[Ans. 887.7K, 53.9bar, 57.8%, 7.6bar]

Q3. At the beginning of the compression process of an air-standard dual cycle with a compression ratio of 18, the temperature is 300 K and the pressure is 0.1 MPa. The pressure ratio for the constant volume part of the heating process is 1.5:1. The volume ratio for the constant pressure part of the heating process is 1.2:1. Determine

- (a) the thermal efficiency and
- (b) the mean effective pressure for the cycle.

[Ans. 63.5%, 5.6bar]