

**Course : Applied Thermal Engineering (UMT303)**

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

**Faculty: Dr. Sayan Sadhu**

**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]**