**BBDNITM**

**MECHANICAL DEPARTMENT**

**SESSION (2018-19)**

**Subject- IC Engine and Compressors [RME-051]**

**Assignment no. 1**

**Theory**

**1.** What does mean by air standard cycle? List assumptions for air standard cycle & give reasons why air standard cycle differs from actual cycle.

**2.** Derive an equation of efficiency, work output and mean effective pressure for Otto cycle.

**3.** Derive an equation of efficiency, work output and mean effective pressure for Diesel cycle.

**Numerical**

**4.** An engine working on Otto cycle has the following condition: Pressure at the beginning of compression is 1 bar and pressure at the end of compression is 11 bar. Calculate the compression ratio and air-standard efficiency of the engine. Assume 𝛾 = 1.4.

**5**. In an Otto cycle air at 17 ℃ and 1 bar is compressed adiabatically until the pressure is 15 bar. Heat is added at constant volume until the pressure rises to 40 bar. Calculate the air standard efficiency, the compression ratio and the mean effective pressure for the cycle. Assume 𝐶𝑝 = 1.004 𝑘𝐽/𝑘𝑔𝐾 and R = 8.314 kJ/kmol K.

**6.** In an S.I. engine working on the Otto cycle, compression ratio is 5.5. The pressure and temperature at the beginning of compression are 1 bar and 27 ℃ respectively. The peak pressure is 30 bar. Determine the pressure and temperature at the salient points, the air standard efficiency and mean effective pressure. Assume ratio of specific heats to be 1.4 for air.

**7**. A spark ignition engine working on ideal Otto cycle has the compression ratio 6. The initial pressure and temperature of air are 1 bar and 37 ℃. The maximum pressure in the cycle is 30 bar. For unit mass flow, calculate a. P, V and T at various salient points b. The ratio of heat supplied to heat rejected Assume 𝛾 = 1.4, R = 8.314 kJ/kmol K

**8.** A Diesel engine has a compression ratio of 20 and cut takes place at 5 % of the stroke. Find the air standard efficiency. Assume 𝛾 = 1.4.

**9.** In an engine working on Diesel cycle inlet pressure and temperature are 1 bar and 17 ℃ respectively. Pressure at the end of adiabatic compression is 35 bar. The ratio of expansion i.e. after constant pressure heat addition is 5. Calculate heat addition, heat rejection and efficiency of the cycle. Assume 𝛾 = 1.4, 𝐶𝑝 = 1.004 𝑘𝐽/𝑘𝑔𝐾 and 𝐶𝑝 = 0.717 𝑘𝐽/𝑘𝑔𝐾.

**10.** The initial conditions for an air standard Diesel cycle operating with a compression ratio of 15:1 are 0.95 bar and 17 ℃. The heat added is 1800 kJ/kg. Calculate the pressure and temperature at the end of each process of the cycle, also determine thermal efficiency and mean effective pressure of the cycle.