

R09**Code: 9A03302****B.Tech II Year I Semester (R09) Supplementary Examinations June 2016****THERMODYNAMICS**

(Common to AE & ME)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 (a) How does the homogeneous system differ from a heterogeneous system?
(b) 1 kg of a fluid is compressed reversibly according to a law $p v = 0.25$ where p is in bar and v is in m^3/kg . The final volume is $\frac{1}{4}$ of the initial volume. Calculate the work done on the fluid also sketch the process on a p - v diagram.
- 2 Calculate the final temperature, pressure, work done and heat transfer if the fluid is compressed reversibly from volume 6 m^3 to 1 m^3 when the initial temperature and pressure of the fluid are 20°C and 1 bar. The index of compression may be assumed as 1, 1.3 and 1.4 respectively. Take $C_p = 1.005$ and $C_v = 0.718$ and $R = 0.287 \text{ kJ/kgK}$.
- 3 (a) Define entropy and show that it is a property of the system.
(b) A cyclic heat engine operated between a source temperature of 900°C and a sink temperature of 50°C . What is the least rate of heat rejection per KW net output of engine?
- 4 A pressure cooker contains 1.5 kg of saturated steam at 5 bar. Find the quantity of heat which must be rejected so as to reduce the quality to 60% dry. Determine the pressure and temperature of the steam at the new state.
- 5 (a) For an Adiabatic process, prove $p v^\gamma = \text{Constant}$ where p , v and γ are pressure, volume and adiabatic exponent.
(b) What is the difference between throttling and free expansion processes?
- 6 (a) Explain the methodology to convert gravimetric analysis in to volumetric analysis with the help of illustration.
(b) Explain Dalton law of partial pressures.
- 7 (a) Explain sensible heating and humidification process and show the processes on psychrometric chart.
(b) What do you mean by adiabatic mixing of air streams? Show the process on a psychrometric chart.
- 8 (a) Derive an expression for the efficiency of semi-pressure cycle.
(b) The compression ratio of an ideal Otto cycle is increased from 6.5 to 8.5. What is the percentage increase in efficiency of the ideal air standard cycle?
