Code: 9A03302

R09

## 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

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- 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 pv = 0.25 where p is in bar and v is in m<sup>3</sup>/kg. The final volume is ¼ 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<sup>3</sup> to 1 m<sup>3</sup> when the initial temperature and pressure of the fluid are 20<sup>o</sup>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 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?
- 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  $pv^{\gamma}$  = Constant where p, v and  $\gamma$  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?

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