## R09

Code: 9A03302

## B.Tech II Year I Semester (R09) Supplementary Examinations June 2016 <br> THERMODYNAMICS <br> (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 $\mathrm{pv}=0.25$ where p is in bar and v is in $\mathrm{m}^{3} / \mathrm{kg}$. The final volume is $1 / 4$ of the initial volume. Calculate the work done on the fluid also sketch the process on a $\mathrm{p}-\mathrm{v}$ diagram.

2 Calculate the final temperature, pressure, work done and heat transfer if the fluid is compressed reversibly from volume $6 \mathrm{~m}^{3}$ to $1 \mathrm{~m}^{3}$ when the initial temperature and pressure of the fluid are $20^{\circ} \mathrm{C}$ and 1 bar. The index of compression may be assumed as $1,1.3$ and 1.4 respectively. Take $C_{p}=1.005$ and $\mathrm{C}_{\mathrm{v}}=0.718$ and $\mathrm{R}=0.287 \mathrm{~kJ} / \mathrm{kgK}$.

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 $900^{\circ} \mathrm{C}$ and a sink temperature of $50^{\circ} \mathrm{C}$. 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 $\mathrm{pv}^{\gamma}=$ Constant where $\mathrm{p}, \mathrm{v}$ 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?

