

QUESTION BANK UNIT 3

Q1. A gas initially at 1.5 bar pressure, 0.15m³ volume and 300K was compressed polytropically($PV^{1.5} = \text{constant}$) to 15bar pressure. Determine the change in entropy. Also work out the approximate entropy change obtained by dividing the heat transferred by the mean absolute temperature during compression. Take $C_p = 1.04 \text{Kj/Kg k}$.

Q2. A pure substance is initially at 5bar pressure and 0.25m³. It under goes reversible adiabatic compression according to the law $PV^{1.3} = \text{constant}$ till pressure becomes 30bar. Determine :

- Change in enthalpy internal energy and entropy
- Heat and work interaction during the process.

Q3. A closed system contains air at 1bar, temperature 290K and volume 0.02m³. This system undergoes a thermodynamic cycle consisting of the following processes in series:

Process 1-2: constant volume heat addition till pressure becomes 4bar.

Process 2-3: constant pressure cooling

Process 3-1: Isothermal heating to initial state.

Represents the cycle on T-S and P-V plot and evaluate the change in entropy for each process.

Take $C_v = 0.718 \text{Kj/kg K}$ & $R = 287 \text{J/kg K}$

Q4. Calculate the change in entropy when 0.2m³ of air at 1bar and 59.90C is compressed to 0.051m³ according to the law $Pv^{1.29} = \text{Constant}$. Take $R = 0.287 \text{Kj/Kg K}$ and adiabatic index is 1.4. Draw the P-V and T-S diagram also.[2013]

Q5. Discuss the significance of Clausius inequality.

Q6. Define the 'entropy'. Also explain how it is a measure of irreversibility?

Q7. Explain the difference between isentropic process and adiabatic process.

Q8. How does the second law of thermodynamics overcome limitations of first law of thermodynamics?

Q9. Show that entropy of universe is increasing.

Q10. Is the adiabatic mixing of fluids irreversible ? If yes, explain.

Q11. Why does entropy generally increase ? Explain.

Q12. Explain the entropy principle and apply it to a closed system.

Q13. How the feasibility of any process can be ensured?

Q14. Give the third law of thermodynamics.

Q15. Explain why the slope of constant volume line is more than the slope of constant pressure line on diagram.

Q16. Explain, whether the arrangement shown below for a reversible engine is feasible. If no then why? Give the correct arrangement

