Question Bank on Vapor Power cycles and Gas Power cycles

1. Explain why the ideal Carnot vapor cycle is not a practical model for a steam power plant, even though it represents the maximum possible efficiency.
2. Draw and label the temperature-entropy (T-s) diagram for an ideal Carnot vapor cycle operating with water as the working fluid.
3. Draw and label the process diagrams for an ideal Rankine cycle on both T-s and enthalpy-entropy (h-s or Mollier) charts.
4. List the four basic processes of the Rankine cycle and describe what happens to the working fluid in each process.
5. Explain why the Rankine cycle's thermal efficiency is generally lower than the Carnot cycle's when operating between the same temperature limits.
6. Why is the pumping work of a liquid in the Rankine cycle much smaller than the compression work of the wet vapor in the Carnot cycle?
7. Explain the Variables affecting the efficiency of the Rankine cycle.
8. Compare the **air-standard efficiencies** of Otto, Diesel, and Dual cycles.
9. Derive the expression for **air-standard efficiency of the Otto cycle**.
10. Explain the effect of **operating variables** (compression ratio, cut-off ratio, pressure ratio) on thermal efficiency of cycles.
11. With neat sketches, explain the **simple Brayton cycle** (P–V and T–S diagrams).
12. A gas engine working on Otto cycle has compression ratio 8. Calculate its **air-standard efficiency**. Assume $\gamma = 1.4$.
13. A gas turbine plant operates on Brayton cycle with pressure ratio 6, maximum temperature 900°C, minimum temperature 27°C. Calculate the **thermal efficiency and work ratio**.