

Assignment: 2

FIRST LAW OF THERMODYNAMICS

1. Explain first law of thermodynamics for a closed system undergoing a change of state and derive energy equation $Q = W + \Delta U$.
2. Justify that energy is property of the system.
3. Derive the steady flow energy equation for a single stream entering and a single stream leaving a control volume and explain the various terms in it. Also write SFEE for following Applications: (i) Cooling Tower (ii) Centrifugal Pump (iii) Expansion valve of refrigerator (iv) Boiler.
4. What is unsteady state flow process? Explain bottle filling process.

SECOND LAW OF THERMODYNAMICS

5. Write the limitation of first law of thermodynamics. Explain the second law of thermodynamics by Clausius statement and Kelvin-Planck statement.
6. Establish the equivalence of Kelvin-Planck and Clausius statements.
7. What is the Carnot cycle? What are the four processes which constitute the cycle?
8. Show that all reversible engines operating between the two constant temperature thermal reservoirs have the same efficiency.
9. Explain the operation of a cyclic refrigerator plant with a block diagram.
10. Evaluate the following statements:
 - I. Heat pump provides a thermodynamic advantage over direct heating.
 - II. Kelvin temperature scale is independent of the peculiar

characteristics of any particular substance.

11. Define following terms

- (I) Heat Engine
- (II) Thermal Energy Reservoir
- (III) Refrigerator

