Assignment: 3

ENTROPY

1. What is entropy principle? With the help of it prove that adiabatic mixing of two fluids is irreversible.

2. In case of heating the gas at constant volume, show that the change in entropy is given by

$$s_2 - s_1 = C_v \log \frac{T_2}{T_1}$$

3. Show that the efficiency of a reversible engine operating between two given constant temperatures is the maximum.

4. With usual notations prove that:

$$\oint \frac{\delta Q}{T} \leq 0$$

5. Prove that entropy is a property of system.

6. Identify the cause of irreversibility.

7. Write down the first and second T-ds equations, and derive the expression for the difference in heat capacities, C_p and C_v. What does the expression signify?

EXERGY

8. Define following terms

(I) Availability

(II) Dead State

(III) High Graded Energy

9. Explain the concept of available and unavailable energy.

10. Explain the concept of decrease in available energy when heat is transferred through a finite temperature difference with the aid of temperature-entropy diagram.

11. Explain the available energy referred to finite heat source.

12. Define available and unavailable energy. With usual notations, show that the availability of a closed system is given by

$$\boldsymbol{\varphi_1 - \varphi_0 = (u_1 + p_0 v_1 - T_0 s_1) - (u_0 + p_0 v_0 - T_0 s_0)}$$

13. Identify the reasons for the impracticability of Carnot cycle.