L. E. COLLEGE - MORBI
DEPARTMENT OF MECHANICAL ENGINEERING
B.E. - SEMESTER – III
ENGINEERING THERMODYNAMICS (3131905)
LAB MANUAL

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Vision of the Department: To deliver quality engineering education for Mechanical Engineers with Professional competency, Human values and Acceptability in the society.

Mission of the Department:
- To nurture engineers with basic and advance mechanical engineering concepts
- To impart Techno-Managerial skill in students to meet global engineering challenges
- To create ethical engineers who can contribute for sustainable development of society

Experiment: 01

Aim: To Study 1ˢᵗ Law of Thermodynamics

- Discuss microscopic and macroscopic point of view in thermodynamics.
- Define following terms with diagram (wherever necessary).

    a. Thermodynamic Equilibrium

    b. Point function and path function

    c. Intensive and extensive property

    d. Displacement work and flow work

- Explain quasi static process with necessary diagrams.
- 1ˢᵗ Law of thermodynamics for closed system undergoing a cycle & change of state.
- Internal Energy concept for a system.

Experiment: 02

Aim: To Study 2nd Law Of Thermodynamics

- Limitations of 1st law of thermodynamics.
- Define below terms:

  a. Thermal reservoir, b. Heat source and Heat sink

    c. Heat engine   d. Refrigerator

    e. Heat Pump   f. PMM-2

    g. Reversible and irreversible process

- Kelvin-Plank and Clausius statements of 2nd law of thermodynamics & their equivalency.
- Carnot cycle & Carnot heat engine.
- Reversed heat engine Or Carnot heat pump
- Reasons for impracticability of Carnot cycle.
- Carnot Theorem & its Corollary.
- Thermodynamics temperature scale.

Experiment: 03

Aim: To Understand Applications of SFEE

- Write steady flow energy equation for the following engineering devices and reduce the same by making suitable assumptions.
- Discuss the SFEE for the following:

  a. Nozzle/Diffuser   b. Heat Exchangers

  c. Steam or Gas Turbine   d. Hydraulic Turbine

  e. Reciprocating Compressor   f. Rotary Compressor

  g. Centrifugal Water Pump   h. Throttling Device.

Experiment: 04

Aim: To Understand Application of Entropy Principle

- What is the meaning of word entropy? Prove that entropy is the point function (Property) of the system.

- State Clausius theorem. Explain Clausius inequality for reversible and irreversible cyclic processes.

- With usual notations prove that $dS \geq \delta Q/T$.

- State principle of increase of entropy. Prove that $dS \geq 0$ OR Show that entropy of isolated system or universe is always increases.

Experiment: 05

Aim: To Compare Otto, Diesel and Dual Cycle

- Otto cycle
    - Processes
    - P-v and T-s diagrams
- Diesel cycle
    - Processes
    - P-v and T-s diagrams
- Dual cycle
    - Processes
    - P-v and T-s diagrams
- Comparison
    - Based on efficiency versus compression ratio
    - Comparison for same compression ratio and same heat input
    - For constant maximum pressure and heat supply
    - For same maximum pressure and temperature

Experiment: 06

Aim: To Study Variables Affecting Performance of Rankine Cycle

- Name of components of Rankine cycle and their functions
- Processes of Rankine cycle
- Schematic diagram of cycle
- P-v and T-s diagram
- Effect of variables
- Superheating of steam
- Increasing boiler pressure
- Decreasing condenser pressure

Experiment: 07

Aim: To Understand Different Components of VCRS & Determine C.O.P.

- Define refrigerant and refrigerant effect

- Schematic diagram of VCRS

- List of components of VCRS and their functions

- Processes of VCR cycle

- P-h diagram

- Derivation of COP

Experiment: 08

Aim: To Understand the Effect of Various Operating Parameters on Performance of VCR Cycle

- Effect of superheat in suction vapour.

- Effect of change in suction pressure.

- Effect of change in discharge pressure.

- Effect of liquid sub cooling.

Experiment: 09

Aim: To Study Construction and Working of Oxygen Bomb Calorimeter

- Definition of fuel and calorific value of fuel

- Introduction and principle of oxygen bomb calorimeter

- Main components

- Schematic diagram

- Working of oxygen bomb calorimeter

- Calculation procedure

- Application of oxygen bomb calorimeter

Experiment: 10

Aim: To Study Construction and Working of Junker's Gas Calorimeter

- Introduction and principle of Junker's gas calorimeter

- Main components

- Schematic diagram

- Working of Junker's gas calorimeter

- Calculation procedure

- Application of Junker's gas calorimeter