Applied Thermodynamics – I

S.E. Sem. III [MARINE]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	–

SYLLABUS

1. **Revision of Thermodynamic concepts**
   System, surrounding, state, path, property, Reversible and irreversible process, thermodynamic work, heat, Temperature, thermal equilibrium. Zeroth law of thermodynamics.

2. **First Law of Thermodynamics**
   Joule's experiment to verify first law. First law applied to non–cyclic process. Internal energy is a property. Joule's experiment of internal energy. Equation of state of ideal gas. Universal and specific gas constant. Application of first law to non flow processes viz. constant volume, constant pressure, constant temperature, adiabatic and polytropic processes. Heat and work calculations. Application of first law to open systems. Steady flow energy equation. Throttling process. Joule's Thomson coefficient. Calculation of work done in steady flow processes.

3. **Second Law of Thermodynamics**
   Limitation of first law of thermodynamics. Heat engine thermal efficiency reversed heat engine, coefficient of performance. Carnot cycle. Kelvin–Planck and Claussius statements and their equivalence. Perpetual motion machines of first and second kind, Carnot theorem. Thermodynamics temperature scale.

4. **Availability**
   Available and unavailable energy. Available energy when heat is withdrawn from an infinite reservoir and when heat is withdrawn from a finite reservoir. Availability of closed systems and steady flow system. Irreversibility.

5. **Properties of Gases**
   Characteristic Equation of State for a Perfect Gas; Equation of State for Real Gas; Internal Energy of a Gas and joule's Law. Two Specific Heats of a Gas and relation between them. Different Gas. Processes an Heat and Work Transfer in Various Gas Processes; Concept of Entropy; Change of Entropy in different, Gas processes : Temperature Entropy Diagram : Applied Problems.

6. **Properties of Steam**
   Wet, dry saturated, superheated steam. Enthalpy, internal energy and entropy of steam. First law of thermodynamics applied of steam processes i.e. constant volume, constant pressure, hyperbolic, isentropic and polytropic processes. Temperature–entropy and enthalpy–entropy diagrams of steam. Methods of determining the dryness fraction. Separating and throttling calorimeter.

   Boilers
   Different types of boilers, Boiler calculations ; Boiler Thermal Efficiency and Equivalent Evaporation of a boiler; Applied Problems.

References :

1. Thermal Engineering (*R.K.Rajput*) – Laxmi Publications
2. Thermal Engineering (*Kothandraman, Domkundwar, Khajuria*) – Arora–Dhanpatrai and Sons.
3. Thermodynamics (*P.K. Nag*) – Tata McGraw Hill Co., 1992.
4. Thermodynamics (*W.C.Reynolds*) – McGraw–Hill, New York, 1969.
5. Thermodynamics (*J.P. Holeman*) – McGraw–Hill 1974.
6. Engineering Thermodynamics (*M.S. Saad*) – McGraw Hill, 1976.
7. Thermal Engineering (*Ballaney*) – Khanna Publishers.
8. Thermodynamics an Engineering Approach (*Yonus Cengal*) – Tata McGraw Hill.

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