II Year – II SEMESTER

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3+1	0	3

THERMAL ENGINEERING – I

UNIT – I

Objectives: To make the student learn and understand the reasons and affects of various losses that occur in the actual engine operation.

Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

UNIT – II

Objectives: To familiarize the student with the various engine systems along with their function and necessity.

I. C. ENGINES : Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems – Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine, principles of supercharging and turbocharging.

UNIT – III

Objectives: To learn about normal combustion phenomenon and knocking in S.I. and C.I. Engines and to find the several engine operating parameters that affect the smooth engine operation.

Combustion in S.I. Engines : Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types.

Combustion in C.I. Engines : Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT – IV

Objectives: To make the student learn to perform testing on S.I and C.I Engines for the calculations of performance and emission parameters.

Measurement, Testing and Performance : Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas

composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

UNIT – V

Objectives: To make students learn about different types of compressors and to calculate power and efficiency of reciprocating compressors.

COMPRESSORS – Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating : Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance, stage compression, undercooling, saving of work, minimum work condition for stage compression.

UNIT VI

Objectives : To make students learn mechanical details, and to calculate power and efficiency of rotary compressors

Rotary (Positive displacement type) : Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

TEXT BOOKS :

1. I.C. Engines / V. GANESAN- TMH
2. Heat engines, vasandani & Kumar publications Thermal

REFERENCES :

1. IC Engines – M.L. Mathur & R.P. Sharma – Dhanpath Rai & Sons.
2. I.C. Engines – Applied Thermosciences – C.R. Ferguson & A.T. Kirkpatrick-2nd Edition-Wiley Publ.
3. I.C. Engines - J.B. Heywood /Mc Graw HIll.
4. Thermal Engineering – R.S.Khurmi & J.S.Gupta- S.Chand Publ.