ME531: Fluid and Thermal Engineering Laboratory (0-0-6:3)-New

List of Experiments

Thermal Science

1) Tubular and Shell and Tube heat exchanger: Measuring and plotting the temperature curves in parallel-counter flow, cross parallel-cross counter flow operation, calculation of mean heat transfer coefficient.
2) Test unit for free and forced convection: Measuring the heat transfer rates, coefficients, efficiencies, Reynolds and Nusselt numbers for free and forced convection through flat plate, pipe bundle and fins.
3) Heat conduction study unit: Determination of thermal conductivity and temperature profile during linear and radial heat conduction.
4) Thermal radiation unit: Verifying the Lambert's cosine law; Kirchhoff's laws on absorptivity, reflectivity and emissivity.
5) Heat conduction in gases and liquids: Determination of thermal conductivities of various fluids at different temperatures during steady-state heat conduction in gases and liquids.
6) Diesel engine study with load variation:

   a. Engine performance b. Combustion c. Heat balance d. Emission
7) Petrol engine study with load variation:

   a. Engine performance b. Combustion c. Heat balance d. Emission
8) Solar irradiation measurement: Intensity of solar radiation with respect of time

Refrigeration

1) Vapour compression refrigeration unit: Understanding the operation of key components of a vapour compression refrigeration system (compressor, evaporator, condenser, and expansion element) and the cycle. Performing the energy balance.
2) Vapour absorption refrigeration unit: Studying the basic principle of an absorption refrigeration system under various loads.

Fluid Mechanics

1. Methods of flow measurement: Measurement of flow rates with venturi, nozzle, orifice meter and determination of corresponding flow rate coefficients. Calibration of the flow measuring devices.
2. *Series and parallel pumps: Determination of head, recording of pump characteristics, hydraulic power.*
3. *Pelton wheel and Francis turbine: Performance analysis and finding the characteristic curves, influence of nozzle cross section and guide vane position on characteristics.*

References:

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2. J. P. Holman, “Heat Transfer”, McGraw Hill.
3. C. P. Arora, “Refrigeration and Air Conditioning”, Tata McGraw Hill.
4. J. Lal, “Hydraulic Machines including Fluidics”, Metropolitan Book.
5. C. S. P. Ojha, R. Berndtsson and P.N. Chandramouli, “Fluid Mechanics and Machinery”, Oxford.
6. S. Som, G. Biswas and S. Chakraborty, “Introduction to Fluid Mechanics and Fluid Machines”, Tata McGraw Hill.
7. D. S. Kumar, “Fluid Mechanics and Fluid Power Engineering”, Kataria and Sons.
8. V. Ganesan, “Internal Combustion Engines”, McGraw Hill.
9. J.B. Heywood, “Internal Combustion Engine Fundamentals”, McGraw Hill.
10. G.N. Tiwari, “Solar Energy”, CRC Press.
11. S.P. Sukhatme and J.K. Nayak, “Solar Energy”, Tata McGraw Hill.