TURBO MACHINES

Subject Code	**: 10ME56**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT -1

Introduction: Definition of turbomachine, parts of turbomachines, Comparison with positive displacement machines, Classification, Dimensionless parameters and their significance, Effect of Reynold's number, Unit and specific quantities, model studies. Application of first and second law's of thermodynamics to turbomachines, Efficiencies of turbomachines. Problems.

07 Hours

UNIT – 2

Thermodynamics of fluid flow: Static and Stagnation states- Incompressible fluids and perfect gases, Overall isentropic efficiency, stage efficiency (their comparison) and polytropic efficiency for both compression and expansion processes. Reheat factor for expansion process.

07 Hours

UNIT – 3

Energy exchange in Turbomachines: Euler's turbine equation, Alternate form of Euler's turbine equation, Velocity triangles for different values of degree of reaction, Components of energy transfer, Degree of Reaction, utilization factor, Relation between degree of reaction and Utilization factor, Problems.

06 Hours

UNIT – 4

General Analysis of Turbomachines: Radial flow compressors and pumps – general analysis, Expression for degree of reaction, velocity triangles, Effect of blade discharge angle on energy transfer and degree of reaction, Effect of blade discharge angle on performance, Theoretical head – capacity

relationship, General analysis of axial flow pumps and compressors, degree of reaction, velocity triangles, Problems.

06 Hours

PART – B

UNIT – 5

Steam Turbines: Classification, Single stage impulse turbine, condition for maximum blade efficiency, stage efficiency, Need and methods of compounding, Multi-stage impulse turbine, expression for maximum utilization factor, Reaction turbine – Parsons's turbine, condition for maximum utilization factor, reaction staging. Problems.

07 Hours

UNIT – 6

Hydraulic Turbines: Classification, Different efficiencies, Pelton turbine – velocity triangles, design parameters, Maximum efficiency. Francis turbine - velocity triangles, design parameters, runner shapes for different blade speeds. Draft tubes- Types and functions. Kaplan and Propeller turbines - velocity triangles, design parameters. Problems.

07 Hours

UNIT – 7

Centrifugal Pumps: Classification and parts of centrifugal pump, different heads and efficiencies of centrifugal pump, Minimum speed for starting the flow, Maximum suction lift, Net positive suction head, Cavitation, Need for priming, Pumps in series and parallel. Problems.

06 Hours

UNIT – 8

Centrifugal Compressors: Stage velocity triangles, slip factor, power input factor, Stage work, Pressure developed, stage efficiency and surging and problems.

Axial flow Compressors: Expression for pressure ratio developed in a stage, work done factor, efficiencies and stalling. Problems.

06 Hours

(Note: Since dimensional analysis is covered in Fluid Mechanics subject, questions on dimensional analysis may not be given. However, dimensional parameters and model studies may be given more weightage.**)**

TEXT BOOKS:

1. **An Introduction to Energy Conversion**, Volume III, Turbo machinery, **V**. Kadambi and Manohar Prasad, New Age International Publishers, reprint 2008.
2. **Turbines, Compressors & Fans**, S. M. Yahya, Tata McGraw Hill Co. Ltd., 2nd edition, 2002

REFERENCE BOOKS:

1. **Principals of Turbomachines**, D. G. Shepherd, The Macmillan Company (1964).
2. **Fluid Mechanics & Thermodynamics of Turbomachines**, S. L. Dixon, Elsevier (2005).
3. **Turbomachine**, B.K.Venkanna PHI, New Delhi 2009.
4. **Text Book of Turbomachines,** M. S. Govindgouda and A. M. Nagaraj, M. M. Publications, 4Th Ed, 2008.

FLUID MECHANICS AND MACHINES LABORATORY

Subject Code	**: 10MEL57**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of coefficient of friction of flow in a pipe.

2. Determination of minor losses in flow through pipes.

3. Determination of force developed by impact of jets on vanes.

4. Calibration of flow measuring devices