

Module-I**University Portion (80%):**

General principles of DC machines: Armature Windings (Simplex Lap and Simplex Wave), Expression for EMF Induced and Torque developed in the Armature counter Torque and Counter or Back EMF, Methods of Excitation, Armature Reaction, Commutation.

DC Machine Characteristics: Conditions for Self Excitation, Critical Resistance and Critical Speed. Internal and External Characteristics for self and Separately Excited DC Generator. Characteristic for Speed~ Armature Current, Torque~ Armature Current and Speed~ Torque of a DC Shunt, Series and Compound Motor and Comparison.

Module-II**University Portion (80%):**

DC Motor Starting and Performance: Necessity of a Starter, Starting of DC Shunt, Series and Compound Motors, Speed Control of DC Shunt and Series motor Losses, efficiency and power flow diagram.

Three Phase Synchronous Generators: Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), the Speed of Rotation of a Synchronous Generator, Induced voltage in A.C Machines, The Internal Generated Voltage of a Synchronous Generator, The Equivalent Circuit of a Synchronous Generator (Armature Reaction Reactance, Synchronous Reactance and Impedance).

Cylindrical Rotor type Three Phase Synchronous Generators: The Phasor Diagram of a Synchronous Generator, Power and Torque in Synchronous Generators (Power Angle Equation and Power Angle Characteristic), Measuring Synchronous Generator Model Parameters (Open Circuit and Short Circuit Tests and Determination of Synchronous Impedance and Reactance, The Short Circuit Ratio), Voltage Regulation and Speed Regulation. Voltage Regulation by Synchronous Impedance Method

Module-III**University Portion (80%):**

Salient Pole type Three Phase Synchronous Generators: Two Reaction Concept, Development of the Equivalent Circuit of a Salient Pole type Three Phase Synchronous Generator (Direct axis and Quadrature axis Reactance, Phasor Diagram for various load power factors, Torque and Power Equations of Salient Pole Synchronous Generator (Power Angle Equation and Power Angle Characteristic with stator resistance neglected). Slip Test for determination of Direct axis and Quadrature axis Reactance.

Parallel operation of Three Phase A.C. Synchronous Generators. The Conditions Required for Paralleling, The General Procedure for Paralleling Generators, Frequency - Real Power and Voltage - Reactive Power Characteristics of a Three Phase Synchronous Generator.

Module-IV**University Portion (80%):**

Three Phase Synchronous Motors: Basic Principles of Motor operation, Steady State Synchronous Motor operation, Starting Synchronous Motors, Synchronous Generators and Synchronous Motors, Operation of synchronous motors connected to bus and phasor diagrams for normal, under and over excited conditions, V and Λ curves, Synchronous Motor Ratings. Application.

Special Purpose Motors: The Universal series motor: constructional features and performance characteristics

Text books:

1. Stephen J. Chapman-*Electric Machinery and Fundamentals*- Mc Graw Hill International Edition, (Fourth Edition), 2015.
2. M.G.Say-*Alternating Current Machines*, English Language Book Society (ELBS)/

Longman , 5th Edition, Reprinted 1990.

Reference books:

1. B.S.Guru & H.R.Hiziroglu-'Electric Machinery & Transformers'-3rd Ed-Oxford Press, 2014.
2. P.C.Sen-'Principles of Electric Machines and Power Electronics'-2nd Edition, John Wiley and Sons, Wiley India Reprint, 2014.
3. A.E.Fitgerland, Charles Kingslay Jr. & Stephen D. Umans -Electric machinery – 6th Edition Mc Graw Hill – Reprint 2015.
4. D.P. Kothari & I.J. Nagrath - Electric Machines – 4th Edition Mc Graw Hill – Reprint 2015.
5. P S Bimbhra – Electrical Machinery –Khanna Publishers.

ELECTRICAL MACHINES LABORATORY-II

List of Experiment:

1. Determination of critical resistance and critical speed from no load test of a DC shunt generator.
2. Plotting of external and internal characteristics of a DC shunt generator.
3. Speed control of DC shunt motor by armature voltage control and flux control method.
4. Determination of the voltage regulation of an alternator by synchronous impedance method and zero power factor (zpf) method
5. Determination of the V and inverted V curves of a synchronous motor
6. Determination of parameters of synchronous machine
7. Positive sequence reactance
8. Negative sequence reactance
9. Zero sequence reactance
10. Determination of power angle characteristics of an alternator
11. Study of parallel operation of two alternators
12. Measurement of direct and quadrature axis reactance of a salient pole synchronous machine
13. Measurement of transient and sub transient reactance of a salient pole alternator