

**EE 442: Electrical Machines - I (EE)**

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(3 - 1 - 0)

Theory Marks = 100  
Sessional Marks = 50

**1. Electro-mechanical Energy Conversion:**

Principle of energy conversion, Induced e.m.f. and torque in rotating machines, Simple commutator and slip rings for supply and collection of current, Magnetically coupled circuits.

**2. D C Generators:**

Constructional features of D.C. Machines, Details of Lap and Wave windings. Methods of excitations – shunt, series and compound generators, E M F equation, Armature reaction, Inter-poles and compensating windings, Commutation, Characteristic of D C generators, Efficiency and Regulation, Parallel operation.

**3. D C Motors:**

Back E.M.F., Torque and Brake Horse Power, Speed and Torque characteristics of shunt, series and compound motors, Starting of D C motors – Starters and grading of starting resistance, Speed control- conventional methods and solid state control, Choice of motors for different duties, Losses and efficiency, Testing – Swinburne's test, Back to back test, Retardation test and Brake test, braking of motors.

**4. Transformer:**

Principles of operation of transformer, voltage and current ratios, Construction – shell type and core type, cooling methods, insulation. Emf equation, Magnetic circuit, leakage flux and leakage reactance, Phasor diagram, per unit values of resistance and reactance, Open circuit and short tests, back to back test, regulation, losses and efficiency, maximum efficiency, all-day efficiency, Auto-transfer, 3-phase transformer, Phase transformation and connections. Parallel operation of transformers, Vector grouping, Harmonics.

**Books:**

1. Langsdorf A.S: Theory of Alternating Current Machinery, McGraw Hill Education
2. Fitzgerald & Kingsley: Electric Machinery, McGraw Hill Education
3. Nagrath D.P. & Kothari I.J: Electrical Machines, Tata McGraw Hill Education
4. Chapman Stephen, J.: Electric Machinery Fundamentals, McGraw Hill Education