

Objectives:

To make the student learn about:

- Constructional details, operation (i) on no load (ii) on load
- Predetermination of regulation and efficiency from OC and SC test results
- Parallel operation of transformers
- Constructional details, principle of operation and the importance of slip in Induction motor operation
- The slip-torque characteristics and torque calculations
- Methods of starting and speed control

UNIT-I Single Phase Transformers

Single Phase Transformers- Constructional Details- Hysteresis and Eddy Current Losses-Emf Equation - Operation on No Load and on Load - Phasor Diagrams.

Equivalent Circuit - Losses and Efficiency-Regulation. All Day Efficiency - Effect of Variations of Frequency & Supply Voltage on Iron Losses.

UNIT-II TESTING OF TRANSFORMERS AND THREE PHASE TRANSFORMERS

OC and SC Tests - Sumpner's Test - Predetermination of Efficiency and Regulation-Separation of Losses Test-Parallel Operation with Equal and Unequal Voltage Ratios - Auto Transformers- Equivalent Circuit - Comparison with Two Winding Transformers.

Three Phase Transformers - Connections - Y/Y, Y/ Δ , Δ /Y, Δ / Δ and Open Δ , Third Harmonics in Phase Voltages-Three Winding Transformers-Tertiary Windings- Scott Connection.

UNIT-III THREE-PHASE INDUCTION MOTORS

Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- Production of a Rotating Magnetic Field - Principle of Operation - Rotor Emf and Rotor Frequency - Rotor Reactance, Rotor Current and Pf at Standstill and During Operation- Rotor Power Input, Rotor Copper Loss and Mechanical Power Developed and Their Inter Relationship.

U. S. A.
BAS-Chairman

UNIT-IV 3-PHASE INDUCTION MOTOR CHARACTERISTICS

Torque Equation - Expressions for Maximum Torque and Starting Torque - Torque Slip Characteristic – Equivalent Circuit - Phasor Diagram - Crawling and Cogging -Circle Diagram- No Load and Blocked Rotor Tests-Predetermination of Performance.

UNIT-V STARTING AND SPEED CONTROL OF INDUCTION MOTORS

Starting Methods and Starting Current and Torque Calculations, Speed Control-Change of Frequency; Pole Changing and Methods of Consequent Poles; Cascade Connection. Injection of an Emf.

OUTCOMES:

After completing the course, the student should be able to do the following:

- Draw the equivalent circuit
- Conduct O.C, S.C tests and predetermine the regulation and efficiency
- Compute the load shared by each transformer when several transformers operate in parallel
- Draw the circle diagram of a three phase Induction motor and predetermine the performance characteristics of three phase induction motor
- Determine the starting torque, maximum torque, slip at maximum torque using given data
- Similarities and differences between transformers and Induction motors

TEXT BOOKS:

1. Electrical Machines, P.S. Bimbhra., Khanna Publishers, 2011.
2. Electric Machines 4th Edition, I.J.Nagrath & D.P.Kothari, Mc Graw Hill, 2014.

REFERENCE BOOKS:

1. Electrical Machinery & Transformers by Irving Kosow –Pearson Publishers, Second Edition, 2012
2. Performance and Design of AC Machines by MG.Say, BPB Publishers, 2002.
3. Theory of Alternating Current Machinery- by Langsdorf, Tata McGraw-Hill Companies, 2nd edition, 2008.
4. Electromechanics-II (transformers and induction motors) S. Kamakshaiah, Hitech publishers, 2005.
5. Electric Machinery - A.E. Fitzgerald, C.Kingsley and S.Humans, Mcgraw Hill Companies, 6th edition, 2003.

V. Sarda

BOS-Chairman