

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
II Year B.Tech. EEE-II Sem

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(A40212) ELECTRICAL MACHINES – II

Objective:

As an extension of Electrical machines I course this subject facilitates to study of the performance of Transformers and Induction motors which are the major part of industrial drives and agricultural pump sets.

UNIT-I:

Single Phase Transformers: Single phase transformers-types - constructional details-minimization of 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: Testing of 1-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.

UNIT-II:

Auto & Poly-Phase Transformers: Auto transformers: Equivalent circuit - comparison with two winding transformers.

Poly-phase transformers : Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Third harmonics in phase voltages-three winding transformers-tertiary windings-determination of Zp, Zs and Zt transients in switching - off load and on load tap changing; Scott connection.

UNIT-IV:

Poly-Phase Induction Motors: Poly-phase 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 relation-torque equation-deduction from torque equation - expressions for maximum torque and starting torque - torque slip characteristic - double cage and deep bar rotors - equivalent circuit - phasor diagram - crawling and cogging.

UNIT-V:

Circle Diagram & Speed Control of Induction Motors: Circle diagram-no load and blocked rotor tests-predetermination of performance-methods of starting and starting current and torque calculations.

Speed control: change of frequency; change of poles and methods of consequent poles; cascade connection. Injection of an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

TEXT BOOKS:

- 1. Electrical machines-PS Bhimbra, Khanna Publishers.
- 2. Principles of Electrical Machines, V. K. Mehta, Rohit Mehta, S. Chand Publishing.

REFERENCE BOOKS:

- 1. Electric Machines, I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers.
- 2. Electric Machines, Mulukutla S. Sarma, Mukesh K. Pathak, Cengage Learning.
- 3. Fundamentals of Electric Machines, B. R. Gupta, Vandana Singhal, New Age International Publishers.
- 4. Electrical Machines, M. V. Deshpande, PHI Learning Private Limited.
- 5. Electrical Machines, R. K. Srivastava, Cengage Learning.
- 6. Performance and Design of AC Machines, MG.Say, BPB Publishers.
- 7. Theory of Alternating Current Machinery, Langsdorf, Tata McGraw-Hill Companies.
- 8. Electric machinery, A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw Hill Companies.

Outcome:

After going through this course the student gets a thorough knowledge on construction operation characteristics and testing of different types of Transformers and construction operation characteristics testing (concept of circle diagram) and speed control methods of poly-phase induction motors, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.