

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH II SEM

L T C
3 1 4

Performance of Transformer and Induction Machines

Course Objectives:

- To understand the working and performance of transformers
- To understand the working and performance of induction motors
- To understand the design of transformers and induction motors

UNIT-I

Single phase transformers

Introduction – Transformer construction and practical consideration – Transformer on No load – Ideal transformer – Real transformer, exact and approximate equivalent circuits, phasor diagrams – Transformer losses – Transformer testing (polarity, open circuit, short circuit and sumpner's tests) – The per unit system – Power efficiency, energy efficiency, effect of load and power factor on efficiency – voltage regulation - Numerical problems

Learning outcomes:

- Learn about the working of single phase transformer
- Learn about the testing of transformers

UNIT-II

Excitation phenomenon in transformers and switching transients - Auto transformer and its comparison with two winding transformer – Three phase transformer connections (star-star, delta-delta, star-delta, delta-star, delta-zig zag star, star-zig zag star) – phase groups – choice between transformer connections – harmonics – three phase bank of single phase transformers (star/star, delta/delta, star/delta and delta/star) – parallel operation of transformers and load division – three winding transformers and stabilization by tertiary winding- Phase conversion (scott connection, three to one phase, three to six phase) – Numerical problems

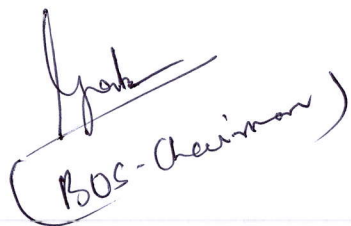
Learning outcomes:

- Learn about auto transformer
- Learn about different three phase transformer connections
- Learn about parallel operation of transformers

UNIT-III

Induction Motor

Construction – Principle of working, flux and MMF waveforms, slip, rotor MMF, torque production – Equivalent circuit – Power across air gap, torque, power output – torque-slip characteristics for different modes, maximum torque, starting torque, maximum power – Tests (No load test, blocked rotor test, voltage ratio test), separation of losses – Circle diagram – Numerical problems


(B. S. Srinivasan)

Learning outcomes:

- Learn about the principle of working of Induction motor
- Learn about various tests on Induction motors
- Learn about circle diagram

UNIT-IV

Starting – Starting of squirrel cage induction motors (direct, reduced voltage, stator impedance, auto transformer, star-delta starting methods) - Starting of slip ring induction motors (rotor resistance starting method) – Cogging and crawling – speed control methods - slip control (voltage control, rotor resistance control, slip frequency EMF injection in rotor circuit) – pole changing - Method of consequent poles - pole amplitude modulation – frequency control – Induction generator – working principle – acceleration time of induction machine – Numerical problems

Learning outcomes:

- Learn about of starting methods of Induction motors
- Learn about the speed control of Induction motors

UNIT-V**Transformers – Design**

Output of transformer, Design of core, Selection of type of winding, Design of insulation, Overall design, No-load current estimation, Design of tank with tubes-Numerical examples.

Induction Machines – Design

Three phase Induction machine output equation and main dimensions, Selection of stator and rotor slots, Length of air gap, and Reduction of harmonic torques, Hemitropic, whole coil and Mush windings-Numerical examples.

Learning outcomes:

- Learn about design of transformers
- Learn about the design of Induction machines

Text Books:

1. Electrical Machines by I.J. Nagrath & D.P. Kothari, The Mc Graw – Hill companies, 4th Edition, 2010.
2. Electrical Machines – P.S. Bimbra., Khanna Publishers, 2011.
3. A course on Electrical Machine Design, 6th edition, Dhanpat Rai & Co Pvt. Ltd., 2014.

Reference Books:

1. The performance and design of alternating current machines by M G Say – PB 2002
2. Electrical Machines – S.K. Battacharya, TMH Edn Pvt. Ltd., 3rd Edition, 2009.
3. Electric Machinery – A.E. Fitzgerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5th Edition, 2003.
4. Electrical Machines – M.V Deshpande, Wheeler Publishing, 2004
5. Electromechanics – I- Kamakshaiah S., Overseas Publishers Pvt. Ltd, 3rd Edition, 2004.

Course Outcomes: After completion of the course, the student will be able to:

- Understand the working and performance of transformers
- Understand the working and performance of Induction motors
- Understand the design of transformers and Induction motors

(Handwritten signature)
(BOS - Chairman)