

POWER CONVERSION DEVICES AND DRIVES

Module-I (8Hrs)

Basic concepts of Modeling: Basic Two-pole Machine representation of Commutator machines, 3-phase synchronous machine with and without damper bars and 3-phase induction machine, Kron's primitive Machine - voltage, current and Torque equations.

Dynamic Analysis of Synchronous Machine: Dynamic performance of synchronous machine, three-phase fault, comparison of actual and approximate transient torque characteristics.

Module- II(12Hrs)

Modeling of Synchronous Machine: Synchronous machine inductances –voltage equations in the rotor's dq0 reference frame- electromagnetic torque-current in terms of flux linkages- simulation of three phase synchronous machine- modeling of PM Synchronous motor

Poly-phase Induction Machines: Introduction, construction and principle of operation, Induction motor equivalent circuit, steady-state performance equations of the induction motor, steady-state performance, Measurement of motor parameters, Dynamic modeling of induction machines.

Module- III(12 Hrs)

Phase controlled rectifiers– Single phase half wave controlled rectifier with R, R-L, R-L with freewheeling diodes. Full wave controlled rectifier with various kind of loads. Half controlled and full controlled bridges with passive and active loads- Input line current harmonics and power factor- Inverter mode of operation. Three phase half wave controlled rectifier with R, R-L and R-L-E loads. Three phase semi and full converters with RL and RLE loads. Input side current harmonics and power factor. Dual converters- Circulating current mode and Non circulating current mode. AC voltage regulators and DC Choppers- Types of ac voltage regulators- single phase full wave ac voltage controllers- single phase transformer tap changers- Multistep transformer tap changer. Three phase ac voltage regulators. Output performance analysis of type A chopper, four quadrant chopper operation.

Module-IV(15 Hrs)

Introduction to motor drives: Components of power electronic Drives- Criteria for selection of Drive components- match between the motor and the load- Thermal consideration- match between the motor and the power electronics converter- characteristics of mechanical systems- stability criteria.

Induction motor drives: Torque speed characteristics of 3-phase induction motor drive, speed control of 3-phase induction motor by varying stator frequency and voltage – impact of non sinusoidal excitation on induction motors- variable frequency converter classifications – variable frequency PWM-VSI drives- variable frequency square wave VSI drives- variable frequency CSI drives- comparison of variable frequency drives- Line frequency variable voltage drives- soft start of induction motors – speed control by static slip power recovery, static Cramer and Scherbius drives.

BOOKS RECOMMENDED :

1. *The Generalized theory of electrical machines (Chapters: 1,2,3,4,5,8 and 11 by B.Adkins and R.H. Hiley.*
2. *Principle, Operation and Design of power Transformer By S.B Vasciitnsky.*
3. *The J & P transformer Book (Chapter: 22&23) By S. Austen Stigant and A.C Franklin.*
4. *Power System Stability & Control (Chapters: 8&9) By P.Kundur, McGraw Hill-1994.*
5. *Ned Mohan etial : Power Electronics , John wiley and sous*
6. *R.Krishnan :Electric Motor Drives – PHI publication*
7. *B K Bose :Modern Power Electronics and AC drives, Pearson Education (Asia)*
8. *P C Sen : Power Electronics TMH Publication*
9. *Dubey : Power Electronics Drives- Wiley Eastern*
10. *10.P.C.Krause, Oleg Wasynczuk, Scott D.Sudhoff, "Analysis of Electrical Machinery and Drivesystems", IEEE Press, Second Edition*