

(EE507) POWER ELECTRONIC CONTROL OF DC DRIVES

Objective of the course:

The course provides basic understanding of main principles of DC drives, various modes of operation, control from converters and choppers.

UNIT – I

Modeling of DC Machines:

Theory of operation-Equivalent Circuit and Electromagnetic Torque-Electromechanical Modeling-State space modeling-Block diagram and Transfer functions

UNIT – II

Single Phase Controlled Converter DC Motor Drives:

Principle of DC Motor Speed Control-Armature control-Field Control-armature and field controls. Single –phase semi converter and single-phase full converter fed Separately excited DC motor- for continuous and discontinuous modes of operation-Problems

UNIT – III

Three Phase Controlled Converter DC Motor Drives:

Three-phase semi converter and three-phase full converter Separately excited DC motor- for continuous and discontinuous modes of operation-Problems-Four Quadrant Operation using Dual Converters-Control modeling of three-phase converter-Two quadrant Three Phase Converter Controlled DC Motor Drive-Transfer Functions of the subsystems

UNIT – IV

Design of Controllers:

Current controller-First order Approximation of Inner Current Loop- speed controller-Simulation of one quadrant DC Motor Drive-The Motor equations-filet in the speed feed back loop-Speed Controller- Current Reference Generator-Current Controller-Flow Chart for Simulation.

UNIT – V

Chopper controlled DC Motor drives

Principle of operation of the chopper – four quadrant chopper circuit – chopper for inversion – chopper with other power devices – model of the chopper – input to the chopper – steady state analysis of chopper controlled DC motor drives – rating of the devices - Closed loop operation of DC Motor drives- Speed controlled drive system current control loop – pulse width modulated current controller – hysteresis current controller – modeling of current controller – design of current controller

REFERENCE BOOKS:

1. R.Krishnan, "Electric motor drives modeling, Analysis and control" 1st ed., Prentice Hall India
2. Shepherd, Hulley, Liang, "Power Electronics and motor control", 2nd ed., Cambridge University Press
3. M.H. Rashid, "Power Electronic circuits, Devices and applications", 1st ed., PHI, 1995
4. G.K. Dubey, "Fundamentals of Electric Drives", Narsa Publications, 1995