SPPU B.E./B.Tech EE Sem 8 syllabus

Power electronic controlled drives

Power Electronic Controlled Drives

CREDITS - 04

Unit 01 : Electrical Drives

A. Definition, Advantages of electrical drives, Components of Electric drive system, Types of Electrical Drives (DC and AC).
B. Motor-Load Dynamics, Speed Torque conventions and multi quadrant operation, Equivalent values of drive parameters. Load Torque Components, Nature and classification of Load. Constant Power operation of a Drive. Steady state stability, Numerical based on motor load dynamics.

Unit 02 : DC Motor Drives

A. Braking methods: Rheostatic, Plugging, and Regenerative. Closed loop control of drives: current limit control, torque control and speed control.
B. Single phase and three phase fully controlled converter drives and performance of converter fed separately excited DC Motor for speed control operations.
Chopper controlled drives for separately excited and series DC Motor operations. Numerical based on above. Closed loop speed control of DC motor below and above base speed.

Unit 03 : Induction motor Drives I

Braking methods: DC Dynamic Braking, AC Rheostatic braking, Plugging, Regenerative Braking, V/f control and comparison with stator voltage control, voltage source inverter (VSI) control, Steady State Analysis. Current source inverter (CSI) control-open and closed loop, Regenerative braking and multiquadrant operation of Induction motor drives, relative merits and demerits of VSI and CSI for induction motor drives, Numerical on VSI and CSI fed I.M. drives.

Unit 04 : Induction Motor Drives II
A. Principle of vector control, Block diagram of Vector control of induction motor. Servo mechanism in drives and block diagram for position control (Descriptive treatment only).
B. Thermal model of motor for heating and cooling, classes of motor duty, types of enclosures for motor.

Unit 05 : Synchronous motor Drives
Types of motor, cylindrical rotor wound field motor, equivalent circuit, speed torque characteristics and effect of power factor, salient pole wound field motor, phasor diagram, simple numerical based on above, closed loop speed control of self controlled synchronous motor drives fed from VSI and CSI.
BLDC drives, block diagram and speed torque characteristics.

Unit 06 : Industrial application
A. Specific requirement and choice of drives for following applications.
1. Machine tools
2. Textile mills
3. Steel rolling mills
3. Sugar mills
4. Traction drives
5. Crane and hoist drives
6. Solar and battery powered drives

Switch gear and protection

Switch gear and Protection

CREDITS - 03

Unit - 1

Fundamentals of protective relaying
Need for protective system, nature and causes of fault, types of faults, effects of faults, evolution of protective relaying, classification of relays, zones of protection, primary and backup protection, essential qualities of protective relaying. Trip circuit of circuit breaker, zone of protection. Various basic operating principles of protection- over current, (current graded and time graded), directional over current, differential, distance, induction type relay, torque equation in induction type relay, current and time setting in

induction relay, Numericals on TSM , PSM and operating time of relay

Unit - 2

Fundamentals of arc interruption
Ionization of gases, deionization, Electric arc formation , Current interruption in AC circuit breaker, high and low resistance principles, arc interruption theories, arc voltage, recovery voltage, derivation and definition of restriking voltage and RRRV, current chopping, interruption of capacitive current, resistance switching, Numerical on RRRV, current chopping and resistance switching.

Unit - 3

Circuit Breaker
Different ratings of circuit breaker (like rated voltage, rated current, rated frequency, rated breaking capacity – symmetrical and unsymmetrical breaking, making capacity, rated interrupting duties, rated operating sequence, short time rating). Classification of high voltage circuit breaker. Working and constructional features of ACB, SF6 VCB- advantages, disadvantages and applications. Auto reclosing.

Unit - 4

A) Static and Digital Relaying
Overview of Static relay, block diagram, operating principal, merits and demerits of static relay. Numerical Relays :-Introduction and block diagram of numerical relay, Sampling theorem, Anti –Aliasing Filter, Block diagram of PMU
B) 3 Phase Induction Motor Protection
Abnormal conditions and causes of failures in 3 phase Induction motor, single phasing protection, Overload protection, Short circuit protection.

Unit - 5

A) Transformer Protection
Types of faults in transformer, Percentage differential protection in transformers, Restricted E/F protection, incipient faults, Buchholz

relay, protection against over fluxing, protection against inrush current,

B) Alternator Protection

Various faults in Alternator, abnormal operating conditions- stator faults, longitudinal percentage differential scheme and transverse percentage differential scheme. Rotor faults-abnormal operating conditions, inter turn fault, unbalance loading, over speeding, loss of excitation, protection against loss of excitation using offset Mho relay, loss of prime mover.

Unit - 6

Transmission line protection

Over current protection for feeder using directional and non directional over current relays, Introduction to distance protection, impedance relay, reactance relay, mho relay and Quadrilateral Relays, Introduction to PLCC, block diagram, advantages, disadvantages, three stepped distance protection, Effect of arc resistance, and power swing on performance of distance relay. Realization of distance relays(impedance, reactance, and mho relay) using numerical relaying algorithm(flowchart, block diagram), Introduction to Wide Area Measurement (WAM) system.