

3rd Semester

PS- 601 : EHV AC & DC TRANSMISSION

1. Long line theory, long distance transmission problems, corona power loss and audible noise. Radio Interference RIV and excitation functions, Reactive Power compensation of EHV AC lines, FACTS devices.
2. Sequential impedances of AC systems EHVAC transmission overvoltages, insulation design of lightning and switching over voltages. High voltage testing of AC equipments.
3. Comparison of EHV AC & DC transmission HVDC system configuration and components conversion and inversion, Analysis of three phase bridge converter and Performance equations abnormal operations of converter.
4. Control of HVDC system, Principle of DC link control, current and Extinction angle control power and reactive power control, alternative inverter control modes.
5. Harmonics and AC/DC filters, Influence of AC system strength on AC/DC system interaction responses to DC and AC system faults. Modelling of HVDC system.

Reference Books:

1. Begemudre R.D., "EHVAC Transmission Engineering – Willy Eastern Ltd.
2. P.Kundur "Power System Stability and Control" - Mc Graw Hill Publication.
3. Arrillaga J., "HVDC Transmission" - Peter Peregrinus Pub.
4. Rao S., "EHV AC & HVDC Transmission Systems" - Khanna Pub.
5. Padiyar K.R., "HVDC Power Transmission Systems" – Willy Eastern Ltd.

PS- 602 EVOLUTIONARY TECHNIQUES

Unit 1

Model classification, Mathematical models, Physical Models, Analog Models, Estimation of Model parameters, Design of experiments, System Identification.

Unit 2

Experimental Nature of Simulation, Steps involved in simulation studies, Validation of Simulation Models, Computer Simulation of continuous & discrete systems; examples.

Unit 3

Introduction, different network configurations (MLP, Hopfield, Kohonen etc.), Feedforward and recurrent networks, Training algorithms – static error back propagation technique and dynamic training algorithms, Computer flow charts for training, NNW applications for control, identification, pattern recognition and system modeling & state estimation.

Unit 4

Concept, Fuzzy relations, membership functions, if-then-rules, matrix representation, defuzzification, fuzzy controllers, applications.

Unit 5

Introduction and concept, schemata, coding, reproduction, cross-over, and mutation, scaling, fitness, applications. Neuro-fuzzy networks, Genetic algorithm in fuzzy controllers, other hybrid applications.

Reference Books :

1. Geoffery Gordon, System Simulation, Prentice Hall India, 1998
2. Robert E.Shannon, Systems Simulation : Art and Science, Prentice Hall
3. J.M.Zurada, Introduction to Artificial Neural System, Jaico Publ. House, Bombay, 1994
4. G.W.Irwin, K. Warwick & K.J.Hunt[Editors], Neural Network Application in Control, Instn of Elect. Engrs, U.K., 1995
5. D.T.Pham & L.Xing, Neural Networks for Identification, Prediction and Control, Springer-Verlag, London, 1995
6. V.Rao & H. Rao, C++ Neural Networks and Fuzzy Logic, BPS, Delhi, 1996
7. D.E.Goldberg, Genetic Algorithms in Search, Optimization, and machine learning, Addison Wesley Publ. Co. INC, NY.

ELECTIVE – III(i)

PS -611 POWER QUALITY

Understanding Power quality, types of power quality disturbances, power quality indices, Causes and effects of power quality disturbances

Causes and effects of harmonics, converter configuration and their contribution to supply harmonics, other sources of harmonics

Radio interference, supply standards, elimination/suppression of harmonics, classical solutions & their drawbacks, passive input filters, high power factor pre-regulator, switching control circuit, transformer connections, Elimination/suppression of harmonics using active power filters – topologies, and their control methods, PWM converter as a voltage source active filter, current source active filter, Electro-magnetic compatibility, constant frequency control, constant tolerance band control, variable tolerance band control, discontinuous current control.

References:

1. Power Quality – by R.C. Duggan
2. Power system harmonics – by A.J. Arrillga
3. Power electronic converter harmonics – by Derek A. Paice

ELECTIVE-III(ii)

PS- 612 SPECIAL MACHINES

1. Squarewave permanent magnet brushless dc motor, magnetic circuit analysis on open circuit torque & emf equations, torque speed characteristics, efficiency, commutation, winding inductances, armature reaction and controllers.
2. Sine wave permanent magnet brushless dc motor, torque & emf equation, Inductance of phase winding, synchronous reactance, phasor diagram, torque-speed characteristics.
3. Switched reluctance motor, static torque production, partition of energy and the effects of saturation, Dynamic torque production, torque speed characteristics, shaft position sensing, solid rotors.
4. Linear Induction Motors, construction, performance, thrust-speed characteristic, application, end effect.
5. Stepper motor – variable reluctance stepper motor, single stack stepper motor multistack stepper motor, permanent magnet stepper motor, Important features of stepper motor, torque v/s stepping rate characteristics, Drive circuits, unipolar drive circuits, Bipolar drive circuits.

Reference Books :

1. Brushless Permanent Magnet & Reluctance Motor Drives – T.J.E.Miller
2. Principles of Electric Machines & Power Electronics – P.C.Sen
3. Electric Drives – G.K.Dubey

ELECTIVE-III (iii)

PS 613 ADVANCED ELECTRICAL DRIVES

1. Electrical Drives Introduction, Choice of Electrical Drives, Dynamics of Electrical Drives, Concept of Multi-quadrant operation, Components of load torques. Selection of motor power rating.

2. D.C.Drive, speed torque, speed control. Starting, Breaking. Controlled rectified fed DC drive, chopper controlled dc drives. Close loop control of d.c. drive. Introduction of transient analysis.
3. Induction Motor Drives : Three phase I.M., analysis and performance. Operation with unbalanced source voltages and single phasing, analysis of I.M. fed from Non-sinusoidal voltage supply. Starting, Breaking, Introduction of transient analysis. Speed control methods, single phase I.M. Close loop control of I.M. Drives.
4. Synchronous Motor Drives, cylindrical rotor wound field motor, salient pole wound field motor, synchronous reluctance motor, Hysteresis synchronous motor, operation from fixed frequency supply, starting, breaking, synchronous motor variable speed drives, starting large synchronous machines.
5. Introduction of Brushless dc motor, stepper motor and switch reluctance motor drives, solar and battery powered drives, Traction Drives, Energy conservation in Electrical Drives.

Reference Books:

1. Power semi conductor controlled drives by G.K.Dubey
2. Fundamentals of Electrical Drives by G.K.Dubey
3. Electrical Machine & Power Electronics by P.C.Sen

ELECTIVE-III (iv)

PS- 614 POWER SYSTEM ECONOMICS

Objectives of deregulation, market players, alternative structures of electricity industry. Electricity marketplaces, role of spot (balancing) markets and power exchanges. Behaviour of participants, market power.

Locational marginal pricing, impact of losses and network constraints, modelling of network constraints, concept of contract networks, locational hedging

Costing and pricing of transmission networks, value of transmission, need for regulation, alternative approaches to investment pricing

Economics and reliability, concept of customer worth of supply

Regulation approaches, revenue recovery and pricing of distribution services

Reference:

‘Power System Economics’

– Steven Stoft, IEEE Press, 2002