

## **MTPA – 201 RELIABILITY EVOLUTION OF POWER SYSTEMS**

### **UNIT I**

Reliability definition , requirement, methods of enhancement, Reliability importance and allocation, concept of random variable, distribution functions, distribution functions of a single random variable.

### **UNIT II**

Failure density function eg. Exponential , Weibul, Normal, Hypoexponential, Hyperexponential etc. Hazard Function, Reliability function and inter relationship, safety and reliability. Effect of Wear-in-period on reliability. Effect of preventive maintenance, Reliability evaluation with component replacement.

### **UNIT III**

Network methods of Reliability evaluation, Event-space method, Decomposition method, Tie-set method and Cut-set method, Random number generators, Generation of random variats from failure distributions eg. Exponential, Normal, Rayleigh etc. Montecarlo simulation based network reliability evaluation. Convergence using coefficient of variation and confidence intervals, Standby systems and load sharing systems, Multi state models.

### **UNIT IV**

Markov modeling , state equations, MTTF calculations, steady state and time dependent state probabilities, System availability and unavailability. Concept of frequency and durations, State enumeration method for frequency, MUT, MDT calculations.

### **UNIT V**

Basic concepts of LOLP, evaluation of indices for isolated system. Generation and Transmission system reliability, analysis using frequency and duration methods. Distribution system reliability evaluation for radial system with perfect and imperfect switching.

### **Reference Books:**

1. Reliability Evaluation of Engineering systems: Concepts and techniques – Roy Billinton, Ronald N. Allan, Pitman Advanced Publishing Program. 1984.
2. Reliability and Maintainability Engineering TMH 2006, C.E. Ebeling
3. J. Endreny, Reliability Modelling in Electrical Power Systems, Jhon Wiley & Sons. Roy Billinton & Ronald, N allan .
4. Reliability Evaluation of Power Systems, Plenum Press, New York

## **MTPA – 202 POWER SYSTEM ECONOMICS & TRADING**

### **UNIT I**

POWER SYSTEM FUNDAMENTALS: Regulation and deregulation ,conditions for deregulation, problems with regulation , problems with deregulating electricity, risk management and forward markets, congestion management, ATC, Energy sector reforms, Indian Electricity Act 2003.

### **UNIT II**

COMPETITION IN POWER MARKET: What is competition, efficiency of perfect competition, marginal cost in power market, role of marginal cost, working with marginal cost, results of marginal cost, screening curve.

### **UNIT III**

MAR KET ARCHITECTURE: Introduction, spot markets, forward markets, settlements, two settlement system, day ahead designs, the day ahead market in theory, the real time market in theory, the day ahead market in practice, the real time market in practice, the market for operating reserves.

### **UNIT IV**

LOCATIONAL PRICING: Power transmission and losses, physical transmission limits, congestion pricing fundamentals, congestion pricing methods, congestion pricing fallacies, refund and taxes, pricing losses on line, pricing losses at nodes, transmission rights.

### **UNIT V**

POWER TRADING: Availability based tariff, power scheduling, unscheduled interchange charges, TOU/ TOD charges, Demand forecasting, National energy policy, National tariff policy.

References Books :

Power system economics-designing for electricity –Steven Soft. (IEEE press and WILEY- INTERSCIENCE)

Loi Lei Lai, “ Power system Restructuring and Deregulation”, Jhon Wiley & Sons Ltd.,Englandss.

Kankar Bhattacharya,Math H.J. Boller, Jaap E. Daalder, “Operatersional of Restructered providers” Klumer Academic Publisher-2001

Mohammad Sahidehpour , and Muwaffaq Alomoush, - “ Restuctured electrical power systems” Marcel Dekker , Inc. 200

## **MTPA – 203 LAB-II**

- 1). Operating Characteristics of Percentage based differential relays.
- 2). Operating Characteristics of Directional Relays.
- 3). Operating Characteristics of the micro controller based over/under voltage relays.
- 4). To draw characteristics and determine time of operation for specific PSM & TLS of electromechanical type IDMT relays.
- 5). Verify correctness of operation of Bus Bar Protection for various bus faults condition.
- 6). Verify operation of generator Protection relay for various types of faults..
- 7). Study of Relay Coordination using any Application software.