

33051 GENERATION TRANSMISSION AND SWITCHGEAR

DETAILED SYLLABUS

UNIT I GENERATION OF ELECTRICAL POWER

Introduction- Conventional methods of power generations – schematic arrangement and choice of site for Hydel, Thermal, Nuclear power plants-Advantages and Disadvantages-comparison of these power plants - Principle and types of co generation.

Schematic arrangement of Diesel, Gas, Pumped storage schemes-Advantages and Disadvantages- Renewable Energy sources-Basic principle of Solar Energy, Grid Connected Solar PV System, Standalone Solar PV System, Hybrid Solar PV System, Wind Power Generation.

Grid or Inter connected system-Advantages of Inter connected systems- Load Transfer through Inter connector-Load curves and Load duration curves-connected load-Average load-Maximum Demand Factor- Plant capacity factor-Load factor and its significance-Diversity factor-Tariff – Types- Factors influencing tariff, Simple problems - Load sharing between base load and peak load plants-Load Dispatching centre standalone system.

UNIT II A.C. AND H.V.D.C TRANSMISSION

A.C. Transmission:

Introduction-Typical Layout of A.C. Power supply scheme various system of power Transmission-Advantages and Disadvantages of A.C Transmission- High Transmission Voltage-Advantages-Economic choice of Transmission voltage-Elements of a Transmission Line- Economic choice of conductor size-Kelvin's Law- Its limitation-over Head Line-Conductor materials and their properties-Line supports-its properties-Types of supports and their applications-spacing between conductors-length of span-Sag in over head lines-Calculation of Sag-When the supports are at equal and unequal levels- Problems- Effect of wind and ice loading over the line conductor (Qualitative treatment only) -

For Notes, Syllabus, Question Papers and Many more constants of a Transmission line- Transposition of Transmission lines- Skin Effect- Ferranti Effect-Corona formation and corona loss-Factors affecting corona-Advantages and Disadvantages-Classification of O.H. Transmission lines- performance of single phase short Transmission line - voltage regulation and Transmission Efficiency-Problems.

H.V.D.C Transmission:

Advantages and Disadvantages of D.C Transmission Layout Scheme and principle of High Voltage D.C Transmission-D.C link configurations (monopolar, Bipolar and Homopolar)-HVDC convertor Station

(Schematic diagram only)

UNIT III LINE INSULATORS AND UNDERGROUND CABLES

Line Insulators:

Introduction - Line Insulator materials-Properties of Insulators Types & causes of failure of Insulators-Testing of Insulators-Potential Distribution over suspension Insulator string-String Efficiency - Methods of improving string efficiency- problems.

Underground cables:

Introduction-Advantages and requirement of cables-construction- of a three core cable-Insulating materials for cables- properties of Insulating materials used in cables-classification of cables-cables for three phase service-construction of Belted cable, screened cable, Pressure cables-Laying of underground cables-Direct laying, Drawing system, Advantages and Disadvantages-Grading of cables- capacitance grading, Inter sheath grading (No derivation and Problems)-cable faults-O.C, S.C and Earth faults.

UNIT IV CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION

Switch gear-Essential features of Switch gear-faults in a Power system (definition only).

Circuit Breakers:

For Notes, Syllabus, Question Papers and Many more

Basic principle of circuit Breaker -Arc Phenomenon methods of Arc extinction-Arc voltage -Restriking voltage and recovery voltage-Rate of rise of restriking voltage-current chopping-Interruption of capacitive current -resistance switching-C.B ratings – Breaking capacity, making capacity, short time rating - Auto reclosing in circuit Breakers - Classification of Circuit Breakers – Construction and Working principle of Oil Circuit Breaker, Air blast Circuit Breaker, E.L.C.B, Miniature circuit breaker (M.C.B) , Residual current circuit breaker , SF6 and vacuum Circuit Breaker

D.C breaking -Problems of D.C breaking-Schematic for HVDC CB producing current zero.

Fuses-Desirable characteristics-Fuse Element materials-current rating of fuse elements-fusing current-Cut off current-L.V fuses- Rewritable fuse, HRC cartridge fuse, HRC fuse with tripping device H.V. fuses & cartridge type, liquid type and metal clad-fuses-Comparison of fuse and circuit breaker.

Over voltage protection:

Voltage surge- causes of over voltage-Lightning-Types of lightning strokes -Direct stroke, indirect stroke-Harmful Effects of lightning - Protection against lightning-Earthing screen, overhead ground Wires, Lightning arresters- Expulsion type, Gapless arrester.

UNIT V PROTECTIVE RELAYS AND GROUNDING

Protective relays:

Basic principles-Fundamental requirements of protective relaying- Primary and back up Protection-relay characteristics-relay timing - Instantaneous relay -Inverse time relay and Definite time lag relay- Inverse definite minimum time relay classification of relays-Construction, Principle of operation and applications of Induction type over current relay (Directional and Non directional),

Distance relay, Differential relay, Negative sequence relay, Induction type reverse power relay, Earth leakage relay. Static relays-Basic elements of static relay

For Notes, Syllabus, Question Papers and Many more

Grounding:

Introduction-Equipment grounding- system grounding ungrounded grounding, Resistance grounding Reactance grounding, resonant Neutral system-Necessity of Neutral grounding -methods-solid grounding-Earthing Transformer.

TEXT BOOK:

1) Principles of Power System V.K.Metha S.Chand & Company, New Delhi 4th Edition Reprint

REFERENCE BOOK:

1) Electrical Power System CLWadhawa New Age International, New Delhi Fourth Edition, 2009

2) A Course in Electrical Power Soni, Gupta Dhanpath Rai &Co (P) Ltd, New Delhi

3) Electrical Power S.L Uppal Khanna Publishers, New Delhi

4) A Course in Electrical Power J.B. Gupta Kaison Publishing House Reprint 2004

5) HVDC Power Transmission System & Technology KR. Padiyar New Age International, New Delhi Reprint 2005

6) Digital Protection – Protective Relaying from Electromechanical to Microprocessor LP Singh New Age International Second Edition 1997.