

POWER SYSTEM ANALYSIS

UNIT –I:

Per Unit Representation & Topology

Per Unit Quantities–Single line diagram– Impedance diagram of a power system – Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y– bus matrix by singular transformation and direct inspection methods.

UNIT –II:

Power Flow Studies

Necessity of power flow studies – Derivation of static power flow equations
– Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) –Decoupled and Fast Decoupled methods (Algorithmic approach) – Problems on 3–bus system only.

UNIT –III:

Z–Bus formulation

Formation of Z–Bus: Partial network– Algorithm for the Modification of Z_{bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference– Addition of element from a new bus to an old bus– Addition of element between an old bus to reference and Addition of element between two old buses (Derivations and Numerical Problems).– Modification of Z–Bus for the changes in network (Problems).

UNIT – IV:

Symmetrical Fault Analysis

3–Phase short circuit currents and reactances of synchronous machine–Short circuit MVA calculations.

UNIT –V:

Symmetrical Components & Fault analysis

Synthesis of unsymmetrical phasor from their symmetrical components– Symmetrical components of unsymmetrical phasor–Phase - shift of symmetrical components in Y– –Power in terms of symmetrical components
– Sequence networks – Positive, negative and zero sequence networks– Various types of faults LG– LL– LLG and LLL on unloaded alternator– unsymmetrical faults on power system.

UNIT – VI:

Power System Stability Analysis

Elementary concepts of Steady state– Dynamic and Transient Stabilities– Description of Steady State Stability Power Limit–Transfer Reactance– Synchronizing Power Coefficient –Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation–Determination of Transient Stability by Equal Area Criterion–Application of Equal Area Criterion–Methods to improve steady state and transient stability.