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EE8003 POWER SYSTEM STABILITY

DETAILED SYLLABUS

OBJECTIVES:

- To understand the fundamental concepts of stability of power systems and its classification.
- To expose the students to dynamic behaviour of the power system for small and large disturbances.
- To understand and enhance the stability of power systems.

UNIT I INTRODUCTION TO STABILITY

Fundamental concepts - Stability and energy of a system - Power System Stability: Definition, Causes, Nature and Effects of disturbances, Classification of stability, Modelling of electrical components - Basic assumptions made in stability studies- Modelling of Synchronous machine for stability studies (classical model) - Rotor dynamics and the swing equation.

UNIT II SMALL-SIGNAL STABILITY

Basic concepts and definitions – State space representation, Physical Interpretation of small–signal stability, Eigen properties of the state matrix: Eigenvalues and eigenvectors, modal matrices, eigenvalue and stability, mode shape and participation factor. Small– signal stability analysis of a Single-Machine Infinite Bus (SMIB) Configuration with numerical example.

UNIT III TRANSIENT STABILITY

Review of numerical integration methods: modified Euler and Fourth Order Runge-Kutta methods, Numerical stability, Interfacing of Synchronous machine (classical machine) model to the transient stability algorithm (TSA) with partitioned – explicit approaches- Application of TSA to SMIB system.

UNIT IV VOLTAGE STABILITY

Factors affecting voltage stability- Classification of Voltage Stability-Transmission system characteristics- Generator characteristics- Load characteristics- Characteristics of reactive power compensating Devices- Voltage collapse.

UNIT V ENHANCEMENT OF SMALL-SIGNAL STABILITY AND TRANSIENT STABILITY

Power System Stabilizer –. Principle behind transient stability enhancement methods: high-speed fault clearing, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast- valving, high-speed excitation systems.

TEXT BOOKS:

1. Power system stability and control, P. Kundur; edited by Neal J. Balu, Mark G. Lauby, McGraw-Hill, 1994.

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2. R.Ramnujam," Power System Dynamics Analysis and Simulation, PHI Learning Private Limited, New Delhi, 2009

3. T.V. Cutsem and C.Vournas, "Voltage Stability of Electric Power Systems", Kluwer publishers, 1998.

REFERENCES

1. Peter W., Saucer, Pai M.A., "Power System Dynamics and Stability, Pearson Education (Singapore), 9th Edition, 2007.

2. EW. Kimbark., "Power System Stability", John Wiley & Sons Limited, New Jersey, 2013.

3. SB. Crary., "Power System Stability", John Wiley & Sons Limited, New Jersey, 1955.

4. K.N. Shubhanga, "Power System Analysis" Pearson, 2017.

5. Power systems dynamics: Stability and control / K.R. Padiyar, BS Publications, 2008

6. Power system control and Stability P.M. Anderson, A.A. Foud, Iowa State University Press, 1977.

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