EE 422: Power System Operations And Control (3-0-2:4)

Power Flow Formulation

Network model formulation, Formation of Y bus, Power flow problem, Different types of buses, Approximate power flow, Gauss Seidel method, Newton-Raphson method, Decoupled Power flow studies, Fast Decoupled power flow studies, Comparison of power flow methods.

Economic Dispatch

Economic dispatch without line losses, Economic dispatch with line losses, Lambda iteration method, Gradient method, Newton's method, Base point and participation factors, Transmission losses, Co-ordination equations, Incremental losses, Penalty factors, B matrix loss formula (without derivation), and Methods of calculating penalty factors including losses.

Unit Commitment

Constraints in unit commitment, Priority list method, Dynamic programming method and Lagrange relaxation methods.

Scheduling

Hydrothermal co-ordination, Scheduling energy, Short term hydrothermal scheduling, Lambda-gamma iteration method, Gradient method, Cascaded hydro plants, Pumped storage hydro scheduling.

Automatic Generation and Voltage Control

Generation with limited energy supply, Take or pay fuel supply contract, Composite generation production cost function, Gradient search techniques. Automatic voltage regulator, Load frequency control, Single area system, Multi-area system, Tie line control.

List of Experiments:

1. Write and simulate an economic load dispatch program without loss
2. Write and simulate an economic load dispatch program with losses
3. Write and simulate an unit commitment program by dynamic programming method
4. Write and simulate an unit commitment program by Lagrange relaxation methods
5. Write and simulate, load flow study program by Gauss Seidel method
6. Write and simulate, load flow study program by NR method
7. Write and simulate, load flow study program by Decoupled methods
8. Perform analysis and control on single area system
9. Perform analysis and control on Multi-area system
10. Write and simulate a hydro-thermal scheduling program by gradient method

Text Books:

1. I.J. Nagrath & D.P. Kothari, "Power System Engineering" TMH.
2. A J wood and B F Wollenberg, "Power Generation Operation and Control", Willey India

3. S. Sivanagaraju & G. Sreenivasan, “Power System Operations & Control”, Pearson

References:

1. Hadi Saadat, “Power System Analysis”, TMH, New Delhi.
2. L.P Singh, “Advance power system analysis and dynamics”, Wiley Eastern Ltd.
3. O.I. Elgerd, “Electrical Energy System Theory: An introduction” TMH.
4. W.D. Stevenson, “Elements of Power System Analysis”, M.G.H.