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EE-601 Control Systems

Credit	L	T	P
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UNIT-I

Introduction, Terminology and basic structure, Industrial control examples, Mathematicalmodeling of mechanical, electrical, thermal, hydraulic and pneumatic systems. Industrial controldevices: Potentiometers, tacho-generators, DC and AC servo-motors, Open and closed loop
systems : their merits and demerits.

UNIT-II

Transfer Functions of linear systems, Block Diagram representation, Block Diagram reductiontechniques, Signal Flow Graphs and Mason's Gain Formula. Time Response analysis of secondorder systems, Performance specifications in time domain. Steady state errors and errorconstants, static error coefficients.

UNIT-III

Stability concept, Necessary conditions for stability. Routh stability criterion, Hurwitz's stabilitycriterion. Root locus plots, examples, general rules for constructing root loci, analysis of controlsystem by root loci. Sensitivity of the roots of the characteristic equation. Relative stabilityanalysis.

UNIT-IV

Relationship between time and frequency response, Polar plot, Bode's Plot, Nyquist plot and Nyquist stability criterion, Relative Stability, Phase and Gain Margins, Constant M and N circleand Nichol's chart.

UNIT-V

Concept of state, State-variable, State model, State models for linear continuous-time function,control system analysis using state-variable methods, state variable representation, conversion ofstate-variable modes to transfer functions, conversion of transfer function to canonical state variable models, solution of state equation, concepts of controllability and observability.Equivalance between transfer function and state variable representation.

TEXT/REFFERENCE BOOKS

1. Gopal, M., "Control Systems: Principles and Design", Tata McGraw Hill Book Co., New
1. Delhi.
2. Gopal, M., "Digital Control Systems and State Variable techniques", Tata McGraw Hill
3. Book Co., New Delhi.
4. Kou, B.C., "Automatic Control System", Prentice Hall of India Pvt. Ltd., New Delhi.
5. Ogata, K., "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., New Delhi.
6. Nagrath and Gopal, "Modern Control Systems" New Age International, New Delhi.