UNIT I

Introduction - Basic elements of control system, Open loop and closed loop systems, Differential equations and transfer function, Modelling of electric systems, Translational and rotational mechanical systems, Block diagram reduction techniques, Signal flow graph.

UNIT II

Time domain analysis : Transient response and steady state response, Standard test inputs for time domain analysis, order and type of a system, Transient analysis of first and second order systems, time domain specifications of second order under damped system from its step response, Steady state error and static error constants.

Chapter 5 : Time Domain Analysis 5-1 to 5-40

UNIT III

Characteristic equation of a system, Concept of pole and zero, Response of various pole locations in s-plane, Concept of stability absolute stability, Relative stability, Stability of system from pole locations, Routh Hurwitz stability criterion, Root locus : Definition, Magnitude and angle conditions, Construction of root locus, Concept of dominant poles, Effect of addition of pole and zero on root locus. Application of root locus for stability analysis.

Chapter 6 : Stability Analysis 6-1 to 6-18

UNIT IV

Frequency response and frequency domain specifications, correlation between time domain and frequency domain specifications, Polar plot, Nyquist stability criterion and construction of Nyquist plots, Bode plot, Determination of frequency domain specifications and stability analysis using Nyquist plot and Bode plot.

Chapter 10 : Polar and Nyquist Plots 10-1 to 10-32

UNIT V

State space advantages and representation, Transfer function from State space, Physical variable form, Phase variable forms : Controllable canonical form, Observable canonical form, Solution of homogeneous state equations, State transition matrix and its properties, Computation of state transition matrix by Laplace transform method only.

Chapter 11 : State Space Representation 11-1 to 11-47

UNIT VI

Concept of Controller, Basic ON-OFF Controller, Concept of Dead Zone, Introduction to P, I, D, PI, PD and PID controller, OFFSET of Controller, Integral Reset, PID Characteristics. Concept of Zeigler-Nicholas method. Concept of Industrial Automation, Need of IoT based Industrial Automation.

Chapter 12 : Controllers and Digital Control Systems 12-1 to 12-29

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