

ELECTIVE COURSE – III PROCESS CONTROL

Unit I -Transfer function

Open loop system - Closed loop system – transfer function modeling – properties of transfer function – transfer function of electrical network – block diagram reduction technique – signal flow graph – mason's gain formula – signal flow graph conversion from block diagram.

Unit II- Mathematical modeling of dynamical system

Mathematical modeling of dynamical system – automatic control System -transient response analysis - Modeling in state space – State space representation of Dynamic systems –Mechanical systems – Electrical and Electronic system – Linearization of Non linear Mathematical Models – Liquid level systems – pneumatic systems – Hydraulic systems – Thermal systems.

Unit III- Stability and Root locus analysis

Characteristic equation of control system – stability condition – Routh's stability criterion- Nyquist stability criterion- special cases- Definition Root Locus -construction root loci- Rules (1-12).

Unit IV- Controllers

Basic control action- proportional, integral and derivative action- Proportional Integral Controller – Proportional Derivative Controller – Proportional – Integral Derivative Controller – Controllers with Limited action – Interaction between Derivative and Integral elements – Non linear effects- Types of Control Schemes – Examples of Cascade Control – Controller settings for cascade systems – Response of Cascade systems to load changes – Feed forward modifications – Interacting control systems.

Unit -V Controlling elements

Self – operated controllers – Pneumatic, Hydraulic, Electrical and Electronic Controllers – theory of automatic controller circuits – two positions and floating controllers- Actuators- Pneumatic actuators – Hydraulic actuators – Electric Motor Actuators – Two position Motor Actuators – Final element power Failure – Fluid flow through control valves – sliding stem control valves – rotating shaft control valves control valve sizing – throttling electrical energy.

Books for study

1. Katsuhiko Ogatta, Modern Control Engineering, PHI Pvt Ltd., New Delhi, (2002). (Unit I &II)
2. S.Palani, Control Systems, Shanmuga Priya publishers, Tiruchirappalli,(1999). (Unit III)
3. Peter Harriott, Process Control, Tata Mcgraw Hill, New York, (1972). (Unit-IV)
4. Donald P Eckman, Automatic Process Control, Wiley Eastern Ltd., Mumbai, (1958) (Unit-V)

Books for Reference

1. Richard C.Dorf, Robert H. Bishop, Modern Control System, Adison Wesley,New Delhi, (1998).
2. Sudhir Gupta, Elements of Control system, PHI Pvt Ltd., New Delhi, (2002).