AUTOMATIC CONTROL SYSTEM (IEC 504)

UNIT I

Introduction to Control system

Basic Idea of Control Systems and their classification, Transfer Function of Electrical, Mechanical Systems, Feedback and its effects, Mathematical Models of Physical Systems, Analogous Systems, Block Diagram, Signal Flow Graph and Mason's Gain Formula. (8)

UNIT II

Time domain Analysis

Type and order of a System – Typical test Signals for the Time Response of control system –Unit step, unit ramp and unit impulse - response of first and second order systems –steady state error – static and dynamic error coefficients –Basic Ideas of Proportional, Derivative, Integral and PID Controllers, Study of Electronic Controllers. (9)

UNIT III

Stability and Frequency Domain Analysis

Concept of Stability, Asymptotic and Conditional Stability, Routh Hurwitz criterion, Root Locus technique – Basic Theory and Properties of Root Loci – Procedure for Construction of Root Loci

Frequency Domain Analysis – Frequency Response – Frequency Domain Specifications, Correlation between Time and Frequency Response, Polar Plot, Bode Plot, Nyquist Stability Criterion, M and N circle. (9)

UNIT IV

Design through Compensation Technique

Compensation Techniques- Lag compensator – Lead compensator – Lag Lead Compensator, Design of Closed Loop Control System using Root Locus and Bode Plot Compensation. (8)

UNIT V

State Variable Analysis

Introduction, State Space Representation, State Models of Linear Systems, State Equations, State Transfer Matrices, Controllability and Observability.

Introduction to Digital Control System, Digital/Discrete Time System. Linear Discrete System, Difference Equation, Roll of Z transform in discrete time system. (8)

Text Books:

1. B.C. Kuo, Automatic Control System, PHI
2. Katsuhiko Ogata, Modern control engineering, PHI
3. I.J.Nagrath & M. Gopal, Control System Engineering, New Age International Publishers
4. Norman S. Nise, Control System Engineering, John Wiley & Sons

Reference Books:

1. S.K. Bhattacharya, Control System Engineering, Pearson Education
2. S.Hasan Saeed, Automatic Control System, Kataria and Sons, New Delhi
3. Narendra Singh Beniwal & Ruby Beniwal, Automatic Control Systems with MATLAB Programming, Laxmi Publications,