Subject Code : P8IE11

CONTROL SYSTEMS

UNIT –I : Introduction:

Open loop and closed loop systems – Representation of physical systems by differential equations and transfer functions – Block diagram algebra – Signal flow graph and Mason's gain formula. State Variable representation. Physical systems – Transfer function from state equations - solution of state equations.

UNIT – II : Time and Frequency Domain Analysis:

Time response of first and second order systems – Steady error and error constants -concept of stability; Routh – Hurwitz criterion – Root, focus techniques – Polar plots and Bode plots – All pass and minimum phase systems – Nyquist stability criterion – phase margin, gain margin – Relative stability.

UNIT – III : State Variable Feedback and Compensators:

Phase lag-phase lead – phase lag lead – networks using asymptotic Bode plots - concept of controllability, observability and reachability - state variable feedback techniques.

UNIT –IV : Non-Linear Systems:

Introduction to non-linearities and non-linear phenomena – Basic concepts of phase – plane method – construction of phase trajectories – System analysis by phase plane method – Describing function methods – Stability analysis using describing functions.

UNIT – V : Stability Analysis of Non-Linear Systems:

Lyapunov's Stability Theorems:

Methods of constructing Lyapunov's functions for non-linear systems – Krasovski's method variable – gradient method – Relative stability – Popov's method circle criterion and its applications.

Books for Study:

1. Modern Control System and Theory and Design, S.M.Shinners, Johy Weily Sons, 1992.
2. Control System Engineering, I.J.Nagrath and M.Gopal, II Edition Willy Eastern, 1985.
3. Modern Control Engineering, K.Ogata, II edition, Prentice Hall of India, 1991.
4. Automatic Control System, B.C.Xvo, VI edition, Prentice Hall of India, 1991.
5. Linear Control System, Melsa and Schultz, McGraw Hill, 1969.
6. Non-Linear Control Systems, M.Vidyasagar, II edition, Prentice Hall of India.