AMICE02 BASIC CONTROL THEORY

UNIT-1 Basic definition

1.1 Basic elements of control system, open loop control system, closed loop control system,
1.2 Control system terminology, manually controlled closed loop systems,
1.3 Automatic controlled closed loop systems, basic elements of a servo mechanism,
1.4 Electrical analogue of mechanical, thermal, hydraulic and pneumatic systems,
1.5 Block diagram representation of physical systems,
1.6 Derivation of transfer functions of physical systems, signal flow graphs, basic control action;
1.7 Block diagram reduction technique, signal flow graph,
1.8 Mason's gain formula, conversion of block diagram to signal flow graph.

UNIT-2 STANDARD TEST SIGNALS

2.1 Time response analysis, impulse response function,
2.2 Analysis of first, and second systems, stability of control system,
2.3 Routh-Hurwitz's stability criterion, static and dynamic errors coefficients, and errors criteria.

UNIT-3 INTRODUCTION OF ROOT LOCUS METHOD

3.1 Rules for constructing root loci, stability analysis of systems using Root locus,
3.2 Determination of roots of the closed loop system,
3.3 Transient response and stability from root locus inverse root locus,
3.4 Concept of dominant, effects of parameter variations on closed loop poles,
3.5 Closed loop pole pair, Root-contour plots, effect of zeros & poles.

UNIT-4 INTRODUCTION OF FREQUENCY RESPONSE

4.1 Bode plots, stability margins on the Bode plot, stability analysis of systems using Bode plots,
4.2 Polar plots, Nyquist stability criterion, relative stability.

UNIT-5 STATE SPACE REPRESENTATION OF SYSTEMS,

5.1 Conversion of state variable models to transfer functions.

UNIT-6 COMPENSATORS:

6.1 Introduction, different types of compensators, design of lag, lead, lag-lead compensators using root locus and Bode diagrams;
6.2 Design of P, I and PID controllers by analytical method, frequency response method and root locus technique.
6.3 Introduction to the use of computers in control.

Reference Books:

1. K. Ogata: Modern Control Engineering. (PHI)
2. I.J. Nagrath & M.Gopal: Control System Engineering. (Wiley Eastern)
3. M. Gopal: Digital Control Systems Principles & Design (TMH)