

**INDEX****UNIT I****Chapter 1 : Basics of Control System****1- 1 to 1-57**

**Syllabus :** Control system : Basics of control system, block diagram and practical examples; Classification of control systems : Open loop and closed loop systems- block diagram, practical example and comparison, Linear and non-linear systems, Time varying and Time In-varying systems- practical example and comparison; Servo system; Transfer function : Close loop and open loop system, RC, LC and RLC circuits - Differential equations and transfer functions and analysis using Laplace transform; Block diagram reduction technique : Need, reduction rules.

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Time Response : Transient and steady state response; Standard test inputs : Step, ramp, parabolic, impulse and their corresponding Laplace transform; Analysis of first and second order control system : 1. Poles and zeros : S-plane representation. Order of system (0, 1, 2) - standard equations, examples and numerical problems; 2. First order system : Analysis for unit step input, Concept of time constant. 3. Second order system : Analysis for unit step input (no derivation), concept, definition and effect of damping; 4. Time response specifications (no derivations) :  $T_p$ ,  $T_s$ ,  $T_r$ ,  $T_d$ ,  $M_p$ ,  $\zeta$ ,  $\omega_n$ , numerical problems. Steady state analysis : Type 0, 1, 2 systems- steady state error and error constants, numerical problems.

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**Chapter 3 : Stability****3-1 to 3-25**

**Syllabus :** Stability : Concept of stability, root location in S-plane and analysis-stable system, unstable system, critically stable system, conditionally stable system, relative stability; Routh's Stability Criterion : Steps and procedures to find stability by Routh's stability criteria

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**Syllabus :** Process Control System : Block diagram, functions of each block; Control actions : Discontinuous mode : ON-OFF controllers - equation, neutral zone; Continuous modes : Proportional controller- offset, Proportional band. Proportional, Integral & Derivative controllers - o/p equations, Response characteristics; Composite controllers : PI, PD, PID controllers- o/p equation, Response

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#### Chapter 5 : Fundamentals of PLC 5-1 to 5-15

**Syllabus** : PLC - Block diagram, classification, (fixed and modular PLCs), need and benefits of PLC in automation; Description of different parts of PLC : CPU - function, scanning cycle, speed of execution, Power supply, Block diagram and function of each block Memory : Function and organization of ROM and RAM, Input and output modules- function, different input and output devices of PLC (only name and their uses); PLC Installation

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#### Chapter 6 : PLC Hardware and Programming 6-1 to 6-40

**Syllabus** : Discrete input modules : Block diagram, specifications of AC input modules and DC input module. Sinking and sourcing concept in DC input modules; Discrete output modules : Block diagram description, specifications of AC output module and DC output modules; Analog input and output modules : Block diagram, specifications; I/O addressing of PLC : Addressing data files, format of logical address, different addressing types; PLC Instruction set : Relay instructions, timer and counter instructions, data movement instructions, logical and comparison instructions ; PLC Programs using Ladder programming language.

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