2.14 40105 COMPUTER IN PROCESS CONTROL

UNIT-1 INTRODUCTION TO PROCESS CONTROL

1.1 Current trends in computer control in process plant
1.2 Centralized computer control system
1.3 Distributed control system
1.4 Total plant Hierarchical control system

UNIT-2 FINAL CONTROL ELEMENT

2.1 Final control element in process control loop
2.2 Actuator and control valve example in control loop of water heating system
2.3 Final control operation- signal conversion, actuator, control element
2.4 Signal conversion- Analog (relay/ amplifier), Digital (DAC),
2.5 Pneumatic Actuator, pneumatic
2.6 Actuator for converting pressure signals into mechanical shaft motion.
2.7 Electrical actuator-solenoid, DC motor, AC motor
2.8 Hydraulic actuator- Hydraulic servo

UNIT-3 FUNDAMENTALS OF PROCESS CONTROLLERS

3.1 Define Process load, process lag, and self-regulation
3.2 Controller system parameters- error, variable range, control lag, dead time
3.3 Discontinuous controller modes- two position mode, multi position mode and its applications
3.4 Continuous controller modes- Proportional, Integral, Derivative mode and its applications
3.5 Composite controller modes-PD, PI, PID controller and applications
3.6 Multivariable control- cascade control and ratio control
3.7 Feed forward control, adaptive controllers, fuzzy logic system

UNIT-4 BUILDING BLOCKS OF AUTOMATION SYSTEM

4.1 Pentium processor-4 features
4.2 Data transfer schemes- Asynchronous, Synchronous, Interrupt driven, DMA
4.3 Communication hierarchy model for industrial automation
4.4 Network data communication-analog, digital, Hybrid
4.5 OSI layer model. Process control network- functions,
4.6 General characteristics- address, data packets, physical media, speed, cycle time
4.7 Bus standards- GPIB IEEE 488, HART protocol, field bus.

UNIT-5 S C A D A

5.1 Introduction
5.2 S C A D A block diagram and description
5.3 Distributed S C A D A system- Star configuration, Daisy chain configuration
5.4 Remote terminal unit- I/O modules, Communication modules, special software facilities.

UNIT-6 DISTRIBUTED CONTROL SYSTEM

6.1 Concept of Decentralized computer control
6.2 Comparison between distributed and centralized
6.3 Advantages of Distributed control system
6.4 Functional requirements of DCS
6.5 Hierarchy of DCS
6.6 Block diagram explanation of Thermal power plant Automation system

UNIT-7 ROBOTICS

7.1 Introduction
7.2 Application of Robots, Degree of freedom, configuration of robot
7.3 Technical features of robot, components of a robot
7.4 Robot sensors- Tactile sensor- touch sensor, force sensor, Proximity sensor,
7.5 Vision sensor, voice sensor

UNIT-8 INDUSTRIAL INNOVATIONS

Reference Books:

1. Computer Based Industrial control by Krishna Kant, PHI
2. Process Control Instrumentation Technology by Curtis D Johnson, PHI
3. PC based Instrumentation- concepts/practice by N Mathivanan, PHI
4. Modern Control Engineering by Katsuhiko Ogata, PHI
5. Mechatronics, CAD, CAM and Robotics by BA Srinivas
6. Advanced Microprocessors by K. Shashi Dhār, Sapna Publications