AUTOMATIC CONTROLS(ME- 308 F)

AUTOMATIC CONTROL SYSTEM

- **Text Books :**

1. Theory & Applications of Automatic Controls by B.C. Nakra, Published by New Age International Pvt. Ltd. Publishers, New Delhi.

2. Modern Control Engg. by Ugata, Prentice Hall of India, New Delhi.

- **Reference Books :**

1. Automatic Control Systems by Kuo' Published by Prentice Hall of India, New Delhi.

2. Control System Engineering, I. J. Nagrath and M. Gopal, New Age , New Delhi.

Syllabus

- ## Section A

Introduction And Applications: Types of control systems ; Typical Block Diagram : Performance Analysis; Applications – Machine Tool Control, Boiler Control, Engine Governing, Aerospace Control, Active Vibration Control; Representation of Processes & Control Elements – Mathematical Modeling. Block Diagram Representation, Representation of Systems or Processes, Comparison Elements; Representation of Feedback Control systems – Block Diagram & Transfer Function Representation, Representation of a Temperature, Control System, Signal Flow Graphs, Problems.

Types of Controllers : Introduction : Types of Control Action; Hydraulic Controllers; Electronic Controllers; Pneumatic Controllers; Problems.

- ## Section B

Transient And Steady State Response: Time Domain Representation; Laplace Transform Representation; System with Proportional Control; Proportional – cum – Derivative control; Proportional – cum – Integral Control; Error Constants; Problems.

Frequency Response Analysis: Introduction; Closed and Open Loop Transfer Function; Polar Plots; Rectangular Plots; Nichols Plots: Equivalent Unity Feed Back Systems; Problems.

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- ## Section C

Stability Of Control Systems : Introduction; Characteristic Equation; Routh's Criterion; Nyquists Criterion, Gain & Phase Margins: Problems.

Root Locus Method : Introduction; Root Ioci of a Second Order System; General Case; Rules for Drawing Forms of Root Ioci; Relation between Root Locus Locations and Transient Response; Parametric Variation; Problems.

- ## Section D

Digital Control System : Introduction; Representation of Sampled Signal; Hold Device; Pulse Transfer Function; Block Diagrams; Transient Response; Routh's Stability Criterion; Root Locus Method; Nyquists Criterion; Problems.

State Space Analysis Of Control Systems: Introduction; Generalized State Equation; Techniques for Deriving System State – Space Equations; Transfer Function from State Equations; Solution of State Vector Differential Equations; Discrete Systems; Problems

Scope of the Subject

- Mathematical modeling of dynamic systems (transfer function, state space representation)
- Stability concepts
- Transient response for first and second order systems
- Root locus analysis
- Frequency response techniques: Nyquist criterion, Bode plots.

What is a Control System?

A Control System consists of subsystems and processes (or plants) assembled to control the outputs of a process.
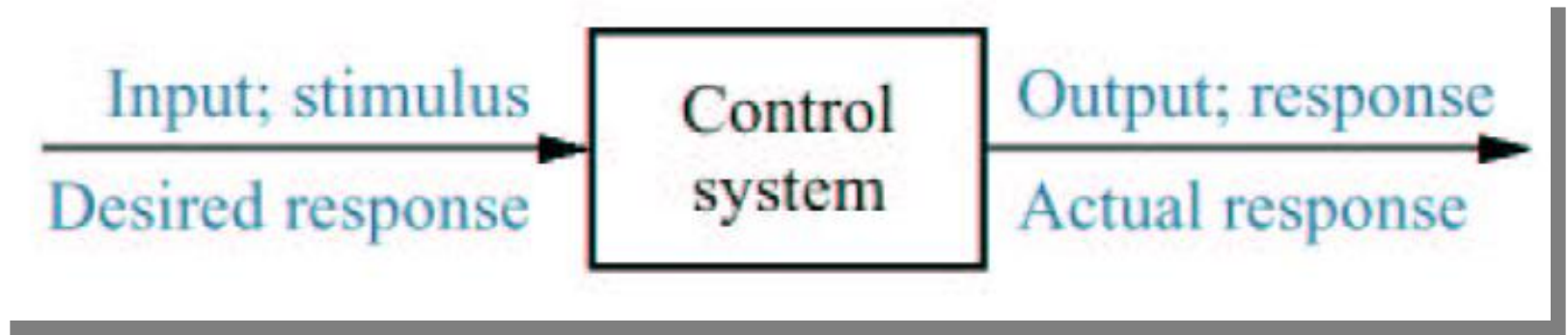
Typical Examples

- Central Temperature Control
- Fluid Level maintenance systems
- Battery Voltage Control
- Human has numerous control systems built in it.

Control System - another view

- A Control System is an arrangement of physical components connected/related in such a manner as to command, direct or regulate itself or another system.
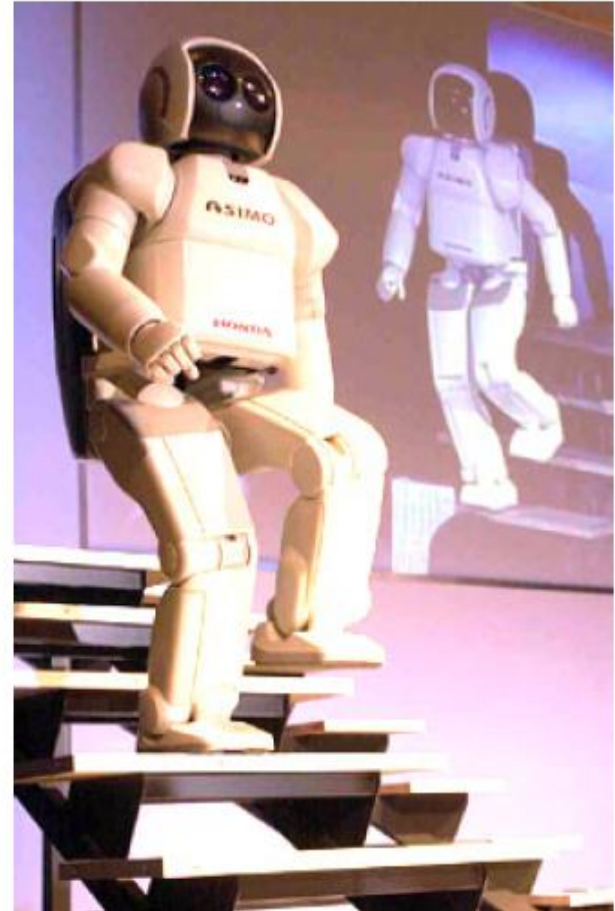
Main Components

- Output:-the actual response obtained from the system

- Input :- the stimulus or excitation applied to a control system from an external source

- Control:- it means direct or command a system so that desired output is attained

- Plant:-the portion of the system which is to be controlled or regulated is called as plant or process

Human like Control

Autonomous planning and Exploration

Underwater

On other planets

In dangerous mines

Industry

Assemble cars

..........Everywhere