CONTROL SYSTEMS AND SIMULATION LABORATORY

The aim of the Control Systems Laboratory is to provide sound knowledge in the basic concepts of linear control theory and design of control systems to understand the methods of representation of systems and design a system and calculate the transfer function, analyzing the stability of the system with time domain approach and frequency response analysis, using MATLAB The students also study the transient and steady state response and effect of PID Controllers on the system.

The main outcome of laboratory is:

1. Recognize the symbols for the different parts of a block diagram: functional blocks, summing blocks and branch points. Simplify a block diagram using block diagram algebra to obtain a transfer function between any two points in the diagram.
2. Model a mechanical (masses, dampers and springs) and electrical system (inductors, resistors, capacitors) in the form of a transfer function.
3. Determine the impulse, step, and ramp response of a system, given a transfer function model.
4. Perform Routh's stability criterion and root locus of a system to determine stability. For systems with unknown values, determine the range of values for which the system will be stable and explain how adding a pole or a zero affects the stability.
5. Analyze feedback control systems in the time and frequency domain to use state space concepts to describe systems.
6. Recognize the "type" of a system (based on the number of free integrators) and discuss the expected error characteristics as related to step, ramp, and acceleration inputs.
7. Interpret design criteria as related to the closed loop pole location on the complex plane.
8. Draw the Frequency response plots like Bode, Nyquist and Polar plots (magnitude and
phase) for a given transfer function.
9. Design feedback compensators to achieve a set of desired closed loop system characteristics and design a compensator in the frequency domain to meet specific design requirements using a lead compensator, lag compensator, or lead-lag compensator.
10. Develop a PLC program for an automatic control system of a medium degree of complexity and select the right hardware for a given application.
11. Consider such aspects of the automation system as network communication, human machine interface, safety and protection against interference.

Facilities:

- Linear System Simulator Kit (02 Nos)
- PLC Trainer Units
- PID Controller Trainer Kit
- Temperature Control System Study Kit
- Servo Motor
- PCs
- MATLAB R2015a

PHOTOS: