SPEED CONTROL OF A DC SERVOMOTOR USING ANALOG CONTROLLER

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ABSTRACT

The design of controllers or compensators of a control system using either the root locus or Bode plot techniques is based on the knowledge of the open-loop transfer function of the system.

This thesis discusses the experimental determination of the transfer function of a dc servomotor using frequency response techniques.

An analog controller is then designed using the Bode plot technique to meet the desired specification. The designed of controller is then simulated using MATLAB. Through a simulation it is shown that the lead controller that is designed meet the desired specification.

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CHAPTER 1

INTRODUCTION

The knowledge of transfer function is needed in order to design a controller using classical techniques such as the root locus or Bode plot. In certain cases the transfer function is known and in certain cases the transfer function is unknown. The transfer function of a system is obtained either from the knowledge of its dynamics or experimentally. One of the technique that is used to obtain the transfer function of a continuous system experimentally is the frequency response.

1.1 Transfer Function

Transfer function of a continuous system is the ratio of the systems output to its input in the s-domain, assuming the initial conditions to be zero. For a continuous system, its dynamic can be described by a set of differential equation. These equations are then laplaced transformed with the initial condition assumed to be zero. The equations are then simplified until an equation linking the output signal to its input signal is obtained. Hence, the transfer function of the system is obtained. If the system's transfer function cannot be obtained analytically, it has to be obtained experimentally.

Once the transfer function is obtained the system's performance can then be analyzed. The system performance can be analyzed analytically or using graphical techniques.

In analytical technique the closed loop transfer function is obtained. Given a specific input to the system, the output function in the s-domain is factorized, partial fractioned and inverse laplaced transformed to get the output equation in the time domain. Once this equation is obtained, the relevant information like the peak time , t_p, percentage overshoot ,M_p , the settling time, t_s, and the final steady