DESIGN OF DIGITAL CONTROLLER FOR AN ARMATURE CONTROLLED MOTOR USING THE DIGITAL APPROXIMATION OF A CONTINUOUS CONTROLLER

Thesis is presented in partial fulfillment for the award of the
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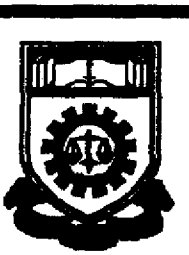

RAHAYU BINTI YAHAYA
Faculty of Electrical Engineering
INSTITUT TEKNOLOGI MARA

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ABSTRACT

A digital controller for an armature-controlled motor is designed using the digital approximation of an analog controller. Several analog controllers are designed using analytical and root locus methods to meet the specifications. The analog controllers then have been designed include PID (Proportional-plus-Integral-plus-Derivative) and lead-lag controllers. MATLAB toolkit is used to obtain the responses of the system with the controllers. The responses of the system are specified in terms of maximum overshoot, steady state error, and the settling time. The best amongst them is used to obtain the digital controller via digital approximation. Six digital approximation methods are used. The results of the simulation of the closed-loop system for both the analog and digital controllers are then presented.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

In recent years there has been a rapid increase in the use of digital controllers in control systems compared to analog controllers. The availability of low-cost microprocessors and microcomputers established a new trend for even small-scale control systems to include digital controller to obtain optimal performance.

In control engineering, digital computers have been used for two different purposes. First, it has been used for the analysis and synthesis of complex control systems including digital simulation and digital computation of complex control dynamics, and the other is to be used as a controller.

1.1 Analog Controller

Even though digital controller is used widely in many industrial processes, nowadays the analogue controller is still being used in most of the system. An analogue control system is a combination of amplifiers, transducers, and actuators, which collectively act on a process to maintain some condition at a required value. Analogue signals represent the variables in an equation by continuous physical quantities.

Three techniques can be used to design analogue controller for single input single output linear systems. These are the frequency response and time response methods, which fall under the category of classical design techniques, and the other one is the state space method which falls under the category of "modern" control design techniques. In the frequency response technique, there are three