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**MONTH YEAR**

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**GRADUATE SCHOOL OF NATURAL & APPLIED SCIENCES**

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**IN**

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**NAME SURNAME**

**BY**

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**Co-Supervisor (if any)**

**Prof. Dr. Name SURNAME**

**by**

**Name SURNAME**

**Month Year**

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# ABSTRACT

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Abstract should be in English, contain only 1 paragraph, and not exceed 1 page.

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# ÖZET

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Özet Türkçe ve tek paragraf olmalı, 1 sayfayı geçmemelidir.

**Anahtar Kelimeler:** Anahtar Kelime 1, Anahtar Kelime 2, Anahtar Kelime 3, Anahtar Kelime 4, Anahtar Kelime 5.

***‘’Dedicated to my family’’***

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TABLE OF CONTENTS

**Page\***

[**ABSTRACT v**](#_Toc536721488)

[**ÖZET**](#_Toc536721489) **vi**

[**ACKNOWLEDGEMENTS viii**](#_Toc536721490)

[**TABLE OF CONTENTS ix**](#_Toc536721491)

[**LIST OF TABLES xi**](#_Toc536721492)

[**LIST OF FIGURES xii**](#_Toc536721493)

**LIST OF SYMBOLS (if any)** [**xiii**](#_Toc536721495)

**LIST OF** [**ABBREVIATIONS (if any) xiv**](#_Toc536721494)

**CHAPTER I**: [**INTRODUCTION 1**](#_Toc536721496)

[1.1. Heading 1 1](#_Toc536721503)

[1.1.1. Heading 2 3](#_Toc536721504)

[1.1.1.1. Heading 3](#_Toc536721505) 8

[1.2. Heading 1](#_Toc536721507) 10

[1.2.1. Heading 2 11](#_Toc536721504)

[1.2.1.1. Heading 3](#_Toc536721505) 14

[1.3. Heading 1](#_Toc536721507) 18

[1.4. Heading 1 20](#_Toc536721503)

[1.4.1. Heading 2 23](#_Toc536721504)

[1.4.1.1. Heading 3](#_Toc536721505) 25

[1.4.1.2. Heading 3](#_Toc536721505) 26

[**CHAPTER II: NAME OF CHAPTER**](#_Toc536721501) **28**

[2.1. Heading 1 28](#_Toc536721503)

[2.1.1. Heading 2 30](#_Toc536721504)

[2.1.1.1. Heading 3](#_Toc536721505) 31

[2.2. Heading 1](#_Toc536721507) 32

[2.3. Heading 1 33](#_Toc536721503)

[2.3.1. Heading 2 35](#_Toc536721504)

[2.3.1.1. Heading 3](#_Toc536721505) 37

**CHAPTER III: NAME OF** [**CHAPTER**](#_Toc536721502) **40**

[3.1. Heading 1 42](#_Toc536721503)

[3.1.1. Heading 2 44](#_Toc536721504)

[3.1.1.1. Heading 3](#_Toc536721505) 48

[3.2. Heading 1](#_Toc536721507) 50

[**CHAPTER IV: NAME OF CHAPTER**](#_Toc536721502) **60**

[4.1. Heading 1 61](#_Toc536721503)

[4.1.1. Heading 2 62](#_Toc536721504)

[4.1.1.1. Heading 3](#_Toc536721505) 63

[4.2. Heading 1](#_Toc536721507) 65

[**CHAPTER V: NAME OF CHAPTER**](#_Toc536721502) **70**

[5.1. Heading 1 71](#_Toc536721503)

[5.1.1. Heading 2 72](#_Toc536721504)

[5.1.1.1. Heading 3](#_Toc536721505) 75

[5.2. Heading 1](#_Toc536721507) 78

**CHAPTER VI:** [**CONCLUSION AND RECOMMENDATIONS**](#_Toc536721524) **80**

[6.1. Recommendations for Future Work](#_Toc536721525) 81

[**REFERENCES**](#_Toc536721526) **82**

[**APPENDIX**](#_Toc536721526) **92**

[**CIRRICULUM VITAE (CV)**](#_Toc536721528) **102**

[**PUBLICATIONS (if any)**](#_Toc536721527) **104**

# \* Below “Page” title, only the page numbers have to be written (the text has to be ended just before page numbers).

#

# LIST OF TABLES

**Page\***

[**Table 1.1** Process parameters](#_Toc533349163) 1

[**Table 1.2** System operating point](#_Toc533349164) 2

[**Table 4.3** Comparison of nonlinear process and linear model using ISE index. 3](#_Toc533349165)

[**Table 4.4** Comparison of controllers by ISE index for abrupt lock-in-place fault](#_Toc533349166) 4

[**Table 4.6** Comparison of controllers by ISE index for abrupt gain losses](#_Toc533349168) 5

[**Table 4.7** Comparison of controllers by ISE index for abrupt periodical leakage](#_Toc533349169) 6

[**Table 5.1** Experiment set-up parameters and operating point 7](#_Toc533349257)

[**Table 5.2** Comparison of controllers with MSE index in the case of stuck actuator failure](#_Toc533349258) 8

[**Table 5.3** Comparison of controllers with MSE index in the case of gain loss fault for pump1 9](#_Toc533349259)

[**Table 5.4** Control performance comparison in the presence of pump2 gain loss fault 10](#_Toc533349260)

[**Table 5.5** MSE performance index of controllers in the case that both actuator fails in different times of experiment 11](#_Toc533349261)

\* Below “Page” title, only the page numbers have to be written (the text has to be ended just before page numbers).

# LIST OF FIGURES

**Page\***

[**Figure 1.1** Equivalent control system block diagram for time-varying gains](#_Toc533349442) 2

[**Figure 3.1** General MIMO MRAC block structure with fault consideration](#_Toc533349461) 3

**\* Below “Page” title, only the page numbers have to be written (the text has to be ended just before page numbers).**

# LIST OF SYMBOLS

|  |  |
| --- | --- |
| **α** | Alfa |
| **β** | Beta |
| **Ω** | Ohm |
| **π** | Pi |

# LIST OFABBREVIATIONS

|  |  |
| --- | --- |
| **A/D** | Analog to Digital |
| **B-SPM** | Bilinear Static Parametric Model |
| **CE** | Certainty Equivalence |
| **D/A** | Digital to Analog |
| **DC** | Direct Current |
| **DIN** | Dynamic Inertial System |
| **FD** | Fault Detection |
| **FDD** | Fault Detection Diagnosis |
| **FDI** | Fault Detection and Isolation |
| **FTC** | Fault Tolerant Control |
| **g-DIN** | Generalized Dynamic Inertial System |
| **ISE** | Integral Square Error |
| **ISR** | Interrupt Service Routine |
| **LQR** | Linear Quadratic Regulator |
| **LTI** | Linear Time Invariant |
| **MIMO** | Multi Input Multi Output |
| **MRAC** | Model Reference Adaptive Control |
| **MSE** | Mean Square Error |
| **PDJ** | Positive Diagonal Jordan |
| **PEA** | Parametric Eigenstructure Assignment |
| **PSUPA** | Power Supply/Power Amplifier Unit |
| **SISO** | Single Input Single Output |
| **SPR** | Strictly Positive Real |

# CHAPTER I

# INTRODUCTION

## 1.1 Motivation of Study

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**Figure 1.1** Equivalent control system block diagram for time-varying gain control equivalent is system block diagram for time-varying gains.

There are wide varieties of control methods in FTC and an extensive research is still conducted. However the lack of a systematical approach is still an open problem. The equation sample can be given as follows:

  (1.1)

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 (1.2)

**Table 1.1** Process parameters

|  |  |
| --- | --- |
| **Parameters** | **Value** |
| Tank height, *hmax* | 25 cm |
| Pomp voltage level | 0-5 V |
| Bottom area, Tank1, Tank2, *A1*, *A2* | 0.01389 m2 |
| Bottom area, Tank3, Tank4, *A3*, *A4* | 0.01389 m2 |
| Out pipe cross-sectional area, *a1,a3,,a2,a4* | 50.26e-6 m2 |
| Pomp constant, *k* | 2.2e-3 lt/Vs |
| Tank1 operating point level *h1o* | 8.0 cm |
| Tank2 operating point level *h2o* | 5.0 cm |
| Tank3 operating point level *h3o* | 1.5 cm |

**Table 1.2** System operating point

|  |  |  |
| --- | --- | --- |
| Control Method | Output1 ISE | Output2 ISE (×103) |
| Design I | 391.59 | 1.0151 |
| Design II | 389.58 | 0.6418 |
| Design III | 379.61 | 0.0001 |

#

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