



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم



**HANAA ALY**



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# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

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**HANAA ALY**



# **ENHANCING STABILITY FOR POWER SYSTEMS USING FACTS CONTROLLERS AND FUZZY PI APPROACH**

By

**TAMER MOHAMED SHEHATA KOTB**

A Thesis Submitted to the  
Faculty of Engineering at Cairo University  
In Partial Fulfillment of the  
Requirements for the Degree of  
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In  
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## Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

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## List of Abbreviations

|             |                                                 |
|-------------|-------------------------------------------------|
| AC          | Amplitude current.                              |
| AP(P)       | Active power.                                   |
| AVR         | Automatic Voltage Regulators                    |
| B2B         | Back To Back                                    |
| DC          | Direct current.                                 |
| DFC         | Dynamic Flow Controller                         |
| EPRI        | Electric Power Research Institute.              |
| FACT        | Flexible AC transmission line.                  |
| FC-TCR      | Fixed Capacitor Thyristor Controlled Reactor    |
| <i>FLC</i>  | Fuzzy logic controller                          |
| <i>GA</i>   | Genetic algorithm.                              |
| GIPFC       | Generalized Interlink Power Flow Controller     |
| GUPFC       | Generalized Unified Power Flow Controller       |
| GTO         | Gate turn-off.                                  |
| HPFC        | Hybrid Power Flow Controller                    |
| HVDC        | High Voltage Direct Current                     |
| IGBT        | Insulated Gate Bipolar Transistors.             |
| IGCT        | Insulated Gate Commutated Thyristors.           |
| IPFC        | Interline Power Flow Controller.                |
| LP          | Linear programming.                             |
| <i>MOV</i>  | Metal-oxide varistor                            |
| OPF         | Optimal power flow.                             |
| PAR         | Phase Angle Regulator                           |
| <i>PCS</i>  | Power conversion or conditioning system         |
| <i>PI</i>   | Proportional integer                            |
| <i>PIC</i>  | Proportional integer control                    |
| PSs         | Power systems.                                  |
| PST         | Phase Shifting Transformer                      |
| PWM         | Pulse width modulation.                         |
| RP(Q)       | Reactive power.                                 |
| <i>SMES</i> | Superconducting Magnetic Energy Storage Systems |

|         |                                                 |
|---------|-------------------------------------------------|
| SSSC    | Static Synchronous Series Compensator.          |
| STATCOM | Static Synchronous Compensator.                 |
| SVC     | Static Var Compensator.                         |
| TCPS    | Thyristor-Controlled Phase Shifter.             |
| TCPST   | Thyristor Controlled Phase Shifting Transformer |
| TC-PAR  | Thyristor Controlled Phase Angle Regulator      |
| TCR     | Thyristor Controlled Reactor                    |
| TCSC    | Thyristor- Controlled Series Capacitor.         |
| TSC     | Thyristor switch control.                       |
| UPFC    | Unified Power Flow Controller.                  |
| VSCs    | Voltage source converters.                      |
| VSI     | Voltage source inverter.                        |