



# **MODEL IDENTIFICATION AND CONTROLLER DESIGN FOR STEAM TURBINE USING DIFFERENT TECHNIQUES**

**BY**

**Eng. MAHMOUD MOHAMED MOHAMED KESHEK**

A Thesis Submitted to the  
Faculty of Engineering at Cairo University  
In Partial Fulfillment of the  
Requirements for the Degree of  
**Master of Science**  
**In**  
**ELECTRICAL POWER AND MACHINES ENGINEERING**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY  
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Under the Supervision of

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**Approved by the  
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**Title of thesis:**

**MODEL IDENTIFICATION AND CONTROLLER DESIGN FOR  
STEAM TURBINE USING DIFFERENT TECHNIQUES**

**Key Words:**

**Single and two areas non-reheat steam turbine, Load Frequency Control, PI Controller, variable structure control with sliding mode**

**Summary:**

This thesis addressed model identification and the design of two different controllers applied to load frequency control of single and two interconnected areas of non-reheat steam turbine. The first controller used in this thesis is PI controller with two methods for tuning its parameter, Ziegler -Nichols (Z-N) Method and fuzzy logic controller.

The other controller in this thesis is variable structure control (VSC) with sliding mode and using genetic algorithm to find the optimum switching vector and feedback gains. Problems in VSC were considered, chattering and feedback gains.

Finally compare between the conventional PI controller and variable structure control.



Cairo University

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رسالة مقدمة الى

كلية الهندسة جامعة القاهرة

كجزء من متطلبات الحصول على درجة ماجستير العلوم

فى

هندسة القوى والالات الكهربائية

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عنوان الرسالة :

### تعريف النموذج الرياضى وتصميم وحدة تحكم للتوربينة البخارية باستخدام تقنيات مختلفة

الكلمات الدالة :

مرحلة واحدة ومرحلتين متصله من التوربينات البخاريه، التحكم فى الحمل والذبذبه، التحكم التناسبي و التكاملي، التحكم فى هيكل متغير

ملخص الرسالة :

تتطرق الرسالة الى تعريف النموذج الرياضى و تصميم نوعين مختلفين من التحكم مطبق على التحكم فى الحمل والذبذبه لمرحلة واحدة ومرحلتين متصله من التوربينات البخاريه. وحدة التحكم الاولى المستخدمة فى هذه الرسالة هى وحدة التحكم التناسبي و التكاملي مع استخدام طريقتين لحساب عامل التحكم ( زيجلر - نيكولاس، ووحدة التحكم المنطقية).

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