Sudan University of Science and Technology

College of Engineering

School of Electrical and Nuclear Engineering

Study and Simulate of Generation Protection at Garri 4 Thermal Station

دراسة ومحاكاة حماية التوليد لمحطة قري 4 الحرارية

A project submitted In partial fulfillment for the requirements of the degree of B.Sc. (honors) Electrical Engineering

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آالية

بسم الله الرحمن الرحيم

قال تعالى:

﴿ قالوا سبحانك ال علم لنا علمتنا إنك أنت العليم الحكيم﴾

صدق الله العظيم

سورة البقرة)23(

DEDICATION

To our great parents, who never stop giving us themselves in countless ways.

To our dearest friends, who leads us through the valley of darkness with light of hope and give us encourage and support.

To our beloved brothers and sisters who stands by us when things look bleak.

To all our family, the symbol of love and giving .

To all the people in our life who touch our heart, we dedicate this research.

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ABSTRACT

Generators are the most superior unit in power system, it consists of several parts such as stator, rotor and DC excitation system, each one of these parts must be protected from abnormal condition and faults. Several of protection functions and principles must be discussed and understand for strong generator protection schema. Generator protection schemes for GARRI 4 were carried out by collecting by collecting generator and protection data from the station, for analyzing these schemes and their calculations then simulating those using ETAP program and protection relays. Different scenarios of abnormal conditions and faults were created by using ETAP simulation to study and analyses. Same thing is said to protection relay, different current and voltage values were injected to simulate the abnormal conditions in order to display the relay response time.GARRI4 generator protection system were studied and emulate.

المستلخص

يعتبر المولد من الأجزاء الأساسية لنظام القدرة الكهربائية. و يحتوي من عدة أجزاء مثل : العضو الثابت و العضو الدوار و بالأضافة الى إثاره للتيارالمستمر.أي جزء من هذه الأجزاء معرض لظروف غير طبيعية لذلك يجب حمايته من هذه الظروف والأعطال لما لها من تأثير سلبي على المولد في العادة تتم حماية المولدات من الأعطال و الظروف الغير طبيعية المسببة لها بواسطة أجزاء من داخل النظام أجزاء اخرى من خارجه تم تحصيل المعلومات المطلوبة للحماية من

محطة قري الحرارية و من ثم تم اجراء بعض الحسابات على مخططات الحماية و الحصول على نتائج تمت هذه الدراسة باستخدام برنامج (ETAP) حيث تم إدخال هذه النتائج في البرنامج و بدوره قام البرنامج بعملية تحليل المحاكاة في البرنامج تم انشاء عدة أحداث غير طبيعية الختبار بيانات نظام الحماية تم الحصول على نتائج مختلفة كاستجابة من نظام الحماية لهذه الظروف الغيرطبيعية تمت دراسة و محاكاة بيانات حماية المولد في محطة قري الحرارية.

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LIST OF ABBREVIATION

DC	Direct Current
CT	Current Transformer
CB	Circuit Breaker
VT	Voltage Transformer
SCADA	Supervisory control and data acquisition
DFT	Discrete Fourier Transform
DSP	Digital Signal Processor
IDMT	Inverse Definite Minimum Time
SI	Standard Inverse
VI	Very Inverse
EI	Extremely Inverse
O/C	Over Current
E/F	Earth Fault
STG	Steam Turbine Generator
GTG	Gas Turbine Generator
Xd	Synchronous Reactance
X′d	Transient Reactance
Xe	Leakage Reactance
AVR	Automatic Voltage Regulation
ETAP	Electrical Transient Analysis Program