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شبكة المعلومات الجامعية

# بسم الله الرحمن الرحيم



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# شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم





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شبكة المعلومات الجامعية

# جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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# بالرسالة صفحات لم ترد بالأصل



ALEXANDRIA UNIVERSITY  
FACULTY OF ENGINEERING

***Performance Improvement of  
Self Excited Induction Generator  
for Renewable Energy System***

A thesis submitted to the

Department of Electrical Engineering

in partial fulfillment of the requirements for the degree of

**Master of Science**

by

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supervised by

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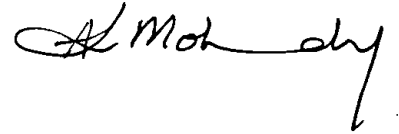
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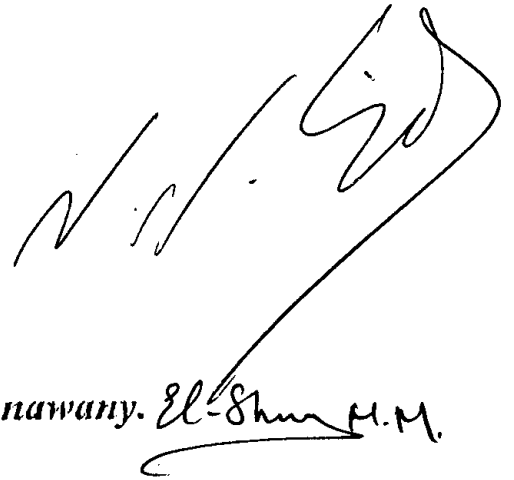
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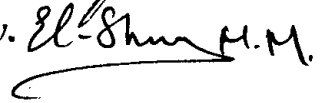
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## ABSTRACT

During the last recent years, a large number of research projects focused on the use and development of new systems utilization alternative sources of energy.

The work covered the development of sources and increase in their productivity, reliability, efficiency and economy. The research project presented aims at improving the performance of self excited induction generators (S.E.I.G.). This type of generators has been known for a long time but it limited in its application, although it offers advantages in other aspects.

The research focuses on improving the performance characteristics of S.E.I.G by introducing control on its exciting capacitors when the three phase induction generator is used to supply single phase load, i.e at an unbalanced operation. Obtained results showed substantial improvement in voltage regulation and stability by introducing a feed back control loop with excitation current using SCR devices. Laboratory investigation were also performed to show the practicality of the solution performed to show the validity of the proposed techniques. The research outlines the main characteristics of self excitation, and the theory behind it. It also surveys recent researches topics relevant to that subject. A brief description of the theory of self excitation is given with a complete evaluation for the performance obtained and its limitations.



## ***Acknowledgment***

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## LIST OF SYMBOLS

OM	Motoring vector.
OG	Generator vector.
V	Output terminal voltage.
$R_1, R_s$	Stator resistance.
$X_1, (X_s)$	Stator reactance.
$R_2, (R_r)$	Rotor resistance.
$X_2, (X_r)$	Rotor reactance.
$X_m$	Magnetizing reactance of induction machine.
$x_c$	Excitation capacitor reactance.
$R_m$	Magnetizing resistance of induction machine.
$V_{0.c}$	Open circuit voltage.
$V_m$	Working voltage (operating voltage) when the machine act as a motor.
$I_m$	Magnetizing current.
$I_c$	Capacitor current.
S	Slip of rotating machine
$L_s$	Stator inductance.
$L_r$	Rotor inductance.
$L_{sr}$	Magnetizing inductance.
$\omega$	Angular frequency.
$I_D$	Stator direct axis current.
$I_Q$	Stator quadrature axis current.
$I_d$	Rotor direct axis current.
$I_q$	Rotor quadrature axis current.
$V_Q$	Stator quadrature axis generator voltage.
C	Excitation capacitance for 3-phase induction generator.