Design and Simulation of Grid-Connected Photovoltaic System
Feed Induction Motor Driving Water Pump

A thesis Submitted to the Department Of Electrical Power Engineering In
partial fulfillment of the requirements for the degree of Master of Science

By
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Also, I would like to express my special thanks to my father, my wife, family members, and friends for their love, moral support and understanding.

Fuad Abu Khadra
DECLARATION

I am, Fuad Abu Khadra, recognize what plagiarism is and I hereby declare that this thesis, which is submitted to the department of Electrical Power Engineering at Hijjawi Faculty for Engineering Technology, for the partial fulfillment of the requirements for the degree of Master of Science, is my own work. I have not plagiarized from any sources. All references and acknowledgments of sources are given and cited in my thesis. I have used the conventional citation and referencing. Each significant contribution to and quoted in this thesis from the work of other people has been attributed and referenced.

Fuad Abu Khadra
DEDICATION

I dedicate this work to my father, my wife, my friends, my family, and anyone helped me to complete this thesis.
ABSTRACT


PHOTOVOLTAIC (PV) solar energy is one of the green energy sources which can play an important role in reducing greenhouse gas emissions, the storage of fossil fuel and global warming, among various renewable energy sources. This proposed work intends to design, simulate, and investigate a three-phase grid-connected photovoltaic (PV) system to feed induction motor, as a prime mover to a centrifugal water pump. Matlab /Simulink software is used to simulate and to investigate the behavior of the proposed system. The proposed system under study consists of a PV array, boost DC-DC Convertor, three-phase three-level inverter, an induction motor, and a centrifugal water pump. In this proposal, the model of the PV array proposed uses theoretical and empirical equations together with data provided by the manufacturer in order to accurately predict the current-voltage curve. The boost DC-DC Convertor is provided with a maximum power point tracker (MPPT) system which automatically varies the duty cycle in order to generate the required voltage to achieve maximum power. The three-phase three-level voltage source inverter is used to convert DC voltage to AC voltage by using VSC controller to improve the capabilities of grid-connected PV system to rapidly exchange active power with electric grid and to keep unity power factor for electric grid.

Keywords: Photovoltaic (PV), MPPT, DC-DC Boost Converter, VSC Controller, Matlab/Simulink, Centrifugal Water Pump.
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