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PI CONTROLLER BASED GENETIC ALGORITHM FOR PV INVERTER USING SPWM TECHNIQUE

MUHAMMAD HAFIZ DZIKRI BIN MOHAMMAD SALIHHUDDIN

BACHELOR OF ENGINEERING (HONS)
ELECTRICAL AND ELECTRONIC ENGINEERING

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Muhammad Hafiz Dzikri Bin Mohammad Salihhuddin
Student I.D. No.	:	202086(
Programme	:	Bachelor of Enginering (Hons.) Electrical and Electronic Engineering (EE200)
Faculty	:	Electrical Engineering Studies
Thesis	:	PI Controller Based Genetic Algorithm for PV Inverter Using SPWM Technique
Signature of Student	:	.....
Date	:	February 2025

ABSTRACT

This study focuses on optimizing a three-phase photovoltaic (PV) inverter system using Sinusoidal Pulse Width Modulation (SPWM) with Genetic Algorithm (GA)-optimized Proportional-Integral (PI) controllers. PV systems convert DC power from solar panels into AC power compatible with the grid. SPWM plays a critical role in generating smooth AC waveforms essential for grid synchronization. However, traditional PI controllers have limitations in dynamic response and robustness under varying conditions. To address these challenges, GA is utilized to optimize PI controller parameters, aiming to improve inverter efficiency, stability, and response. MATLAB/Simulink simulations are conducted to validate this approach, demonstrating the superior performance of GA-optimized PI controllers in tasks such as setpoint tracking, disturbance rejection, and ensuring system stability. This research seeks to enhance the reliability and efficiency of PV inverters through innovative control strategies, thereby contributing to improved energy conversion and grid reliability. Future initiatives may include experimental validation in real-world PV systems to further refine and validate these control strategies.

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