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**INDUCTION MOTOR AND VECTOR CONTROL BASED  
PROGRAMMABLE LOADING UNIT FOR LOAD  
TESTING OF DIFFERENT MOTORS**

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Degree of Master of Science

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Sri Lanka

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree  
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Prof. J.P. Karunadasa

## **Abstract**

Electrical machines are extensively utilized in contemporary systems that require mechanical operation. Along with its popularity, ongoing studies and developments are underway for machines' performance and efficiency enhancement. Motor testing holds a significant role in research and development. It was stated that motors must be tested under various practical scenarios such as post manufacturing, rewinding, and changes in environmental factors etc. It was stated the type tests conduction on motors are necessary to ensure that it meets specified standards and regulatory requirements. The purpose of these tests is to verify thermal and mechanical compatibility for supplying the rated power over an extended period. Current practice for testing using conventional loading units like eddy current brake testing, temperature rise testing and DC lamp load testing have their own drawbacks like less controllability, bulky arrangement, being expensive and inefficient.

However in this research, the proposed loading unit simulation model was designed to verify a more controllable, compact, simple and yet cost effective loading unit comparatively for conventional methods which can be used to test motors. The proposed programmable loading unit simulation consist of an Induction Motor (IM) connected with a test motor where the IM is operated by power electronics(PE) controllers with the usage of vector controlling technique. The PE controllers include of a bi-directional IGBT based rectifier to enable the bidirectional flow of power between induction motor and the utility grid and CC PWM VSI to energize the Induction Motor.

The study aims to progressively develop a simulation of a vector control based 3 phase induction motor programmable loading unit that can be directly coupled to a given motor to conduct load testing.

***Keywords:*** *Induction Motor, Vector control, Simulation, Programmable loading unit, AC to DC bidirectional converter*

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R.A.D.S. Ranasinghe

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## List of Abbreviations

<b>Abbreviation</b>	<b>Description</b>
<i>MATLAB</i>	<i>Matrix Laboratory</i>
<i>PI</i>	<i>Proportional Integral</i>
<i>RMS</i>	<i>Root Mean Square</i>
<i>AC</i>	<i>Alternating Current</i>
<i>DC</i>	<i>Direct Current</i>
<i>IM</i>	<i>Induction Motor</i>
<i>VSI</i>	<i>Voltage Source Inverter</i>
<i>PWM</i>	<i>Pulse Width Modulation</i>
<i>PLL</i>	<i>Phase Locked Loop</i>
<i>CC</i>	<i>Current Control</i>
<i>PE</i>	<i>Power Electronics</i>
<i>FOC</i>	<i>Field Of Control</i>
<i>IEC</i>	<i>International Electrotechnical Commision</i>
<i>NEMA</i>	<i>National Electrical Manufacturers Association</i>
<i>IGBT</i>	<i>Insulated Gate Bipolar Transistors</i>