# MODELLING AND SIMULATION OF DC CHOPPER USING MATLAB/SIMULINK

This thesis is presented in partial fulfillment for the award of the Bachelor of Electrical Engineering (Hons)

### UNIVERSITI TEKNOLOGI MARA



### MARUAN BIN IBRAHIM

Faculty of Electrical Engineering UNIVERSITI TEKNOLOGI MARA 40450 Shah Alam Selangor Darul Ehsan

#### ACKNOWLEDGEMENT

All praises be to Allah, Most Gracious and Merciful with also bless and regard to Nabi Muhammad SAW, his companion and the people who follow his path.

Thanks to Allah who has given me strength and ability to complete this work. I would like to express my gratitude neither to my project supervisor, Pn. Siti Zaliha bte Mohd Nor for her guidance, advice, ideas and opinions in completing this work.

My deepest gratitude and thank to my beloved parents for their endless support and understanding; staff of Faculty of Electrical Engineering who which have help toward the completion of this project. May Almighty Allah bless and give reward to them for their generosity.

Lastly, I want to express my greatest gratitude to my colleagues who have been giving me advice and opinion to complete this thesis whether it is directly or indirectly.

The kindness, corporation and support from all of the above mentioned people would always be remembered and only Allah SWT could repay their kindness.

#### ABSTRACT

A four Quadrant DC-to-DC converters used to control the DC motor drive that require forward and reverse motoring as well as forward and reverse braking, DC motor drive system controlled by Pulse Width Modulation (PWM) technique are expected to replace the conventional phase controlled system. This is due to their simple control, high ratability, low cost and fast response. A DC Chopper converts directly from DC-to-DC and also knows as DC-to-DC converter. It is considered a dc equivalent of an AC transformer with a continuously variable turn's ratio. DC Chopper may be classified according to the number of quadrant of the Vd-Id diagram and polarities in which there are capable of operating. The polarity of the output voltage and the direction of energy flow cannot be changes. The output of the DC Chopper maybe controlled using the (PWM), generated by comparing a triangle wave signal with an adjustable dc reference and hence the duty cycle of the switching pulse could be varied. This algorithm is required to provide a stream of PWM train to turn on and off the switches that will synthesize the required dc-dc conversion, the implementation DC Chopper requires different bi-directional switching arrangements depending on the desired operation requirement of the four quadrants defined. This paper present work on development of four quadrant DC-to-DC converter using the Power System Block Set (PSB) within the MATLAB/Simulink (MLS) environment. The output is being synthesized using Pulse Width Modulation (PWM) technique. The four quadrant DC Chopper is supplied by a V DC voltage source; the load takes the form of a pure resistive, inductance with battery E representing a back emf of a dc motor.

# TABLE OF CONTENTS

## PAGE

Acknowledgments	3
Abstract	5
Table of contents	6
List of Figures	10
List of Table	13
List of Abbreviation	14

## **CHAPTER 1: INTRODUCTION**

1.0	Background of study	15
1.1	Problem Statement	16
	1.1.1 Problem identification	16
	1.1.2 Signification of the study	16
1.2	Research objective	17
1.3	Scope of Work	17
1.4	Research Methodology	18
1.5	Thesis Organization	19

## **CHAPTER 2: REVIEW OF DC CHOPPER**

2.2 Power Electronic Device in SPMC 22   2.2.1 Diode 22   2.2.2 Insulated Gate Bipolar Transistor (IGBT) 23   2.3 Converter Classification 25	2.0	Introduction	21
2.2.1 Diode222.2.2 Insulated Gate Bipolar Transistor (IGBT)232.3Converter Classification25	2.1	Power electronic	21
2.2.2 Insulated Gate Bipolar Transistor (IGBT)232.3Converter Classification25	2.2	Power Electronic Device in SPMC	22
2.3 Converter Classification 25		2.2.1 Diode	22
		2.2.2 Insulated Gate Bipolar Transistor (IGBT)	23
2.4 Bi-directional Switch 26	2.3	Converter Classification	25
	2.4	Bi-directional Switch	26

27

2.5 Conclusion

# CHAPTER 3: PROPOSED FOUR QUADRANT DC TO DC CONVERTER

3.0	Introduction	and the second	28
3.1	Commutation Strategy		30
3.2	Control Strategy (PWM)		30
			30
3.3	Proposed DC Chopper operation		31
3.4	Conclusion		34