

SOFTWARE DEVELOPMENT OF TRANSIENT ANALYSIS IN SYNCHRONOUS GENERATOR

This Project Report is presented in partial of fulfillment for the award of the
Bachelor of Electrical Engineering (Honours)(Power)

UNIVERSITI TEKNOLOGI MARA



**AZREENA BINTI SAIDIN
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM
SELANGOR DARUL EHSAN
MALAYSIA**

ACKNOWLEDGEMENT

In the name of Allah S.W.T, the author would like to take this opportunity to express her special gratitude to her project supervisor, Pn. Bibi Norasiqin Bte Sheikh Rahimullah for her guidance, support and advise during completing this project.

Heartiest gratitude goes to En. Maliki and En. Farid for their dedication in advice and willingly in giving their ideas for the completion of this project and to individuals who have given encouragement to make this project success. And last but not least, to her family and her classmate for their support and doa.

ABSTRACT

This thesis describes a developed software to perform the transient analysis of synchronous generator. The software is developed using Matlab 5.3 and Microsoft Visual Basic (VB) Version 6.0. The results of the simulation using the developed software provide the value of the transient phase currents. The results are also displayed in graphical form. For the simulation purposes, a 500MVA, 30kV, 60Hz synchronous generator is used as an example.

Keywords - Synchronous Generator, Transient Analysis, Short Circuit, Phase Current.

LIST OF CONTENTS

CHAPTER	DESCRIPTION	PAGE
	DECLARATION	i
	DEDICATION	ii
	ACKNOWLEDGMENT	iii
	ABSTRACT	iv
	LIST OF CONTENTS	v
	LIST OF FIGURES	viii
	LIST OF TABLE	x
	LIST OF ABBREVIATIONS	xi
1	INTRODUCTION	1
	1.1 Scope of Work	2
	1.2 Scope of the Thesis	2
2	SYNCHRONOUS GENERATOR	
	2.0 Introduction	4
	2.1 Synchronous Generator Construction	5
	2.2 Generator Model	7
3	TRANSIENT ANALYSIS	
	3.0 Introduction	9
	3.1 Synchronous Generator Transient	9
	3.2 Transient Stability of Synchronous Generator	12
	3.3 Short Circuit Transient in Synchronous Generator	13
	3.4 Inductances of Salient Pole Machines	16
	3.5 The Park Transformation	19
	3.6 Balanced Three-Phase Short Circuit	24

CHAPTER 1

INTRODUCTION

Understanding transients has been a very important task for power system engineers and advanced students who are interested in system dynamics. Power system transients involved the dynamics of all individual network components, electric loads and generating units[1]. For performing system wide transient analysis, it is always necessary to have a rigid understanding of the transient behavior of the individual system equipment, especially the synchronous generators which generally dominate the system transient behavior.

This software is developed because one of the most difficult components to model in a power system is the synchronous generator and the calculation of the transient performance of a power system is an important task. Much recent work has been expended in this area.

Many software have been developed to perform the analysis. These software offer several advantages over manual calculation such as provide faster result, the values obtained are more accurate and the output will be displayed in form of table and graphical. This thesis will introduce a software based on this concept, which is developed to perform the simulation in transient analysis of the synchronous generator.

Adjustment of the field current of a synchronous generator or motor connected to a constant-voltage system provides for control of power factor. In a free standing synchronous generator, it also provides control of stator voltage. Therefore, it is important to know how rapidly the machine responds to changes in its field-supply voltage. It is also important to the value of stator current after a sudden change at the stator terminals, such as a short circuit, so that protection systems can be properly designed[2]. In order to determine the