TRANSIENT STABILITY OF A SINGLE MACHINE CONNECTED TO AN INFINITE BUS

This thesis is presented in partial fulfillment for the award of the

Bachelor of Engineering (Hons) Electrical

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA

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ACKNOWLEDGEMENT

In the name of ALLAH S.W.T, The most Beneficent, The most Merciful. It is with the deepest sense of the Al-Mighty Allah that gives me the strength and ability to complete this project. All good aspirations, devotions and prayers are due to ALLAH whose blessing and guidance have helped me throughout the entire project.

I would like to acknowledge and express my sincere gratitude towards my supervisor Mdm. Wan Noraishah bt Wan Abd Munim for her concern, valuable time of consultation and advice, guidance and patience in supervising my project from the beginning until the completion of this thesis.

Sincere thanks to my classmates, course-mates and lecturers for their kindness and opinions. All of them had shared their knowledge and understanding on this study and of course, they are the ones who have showered me with moral support and motivation during my studies. Thank you for helping me during my toughest times.

Last but not least, my deepest gratitude to my beloved mother;

and my wife; Muna Munirah bt Mohmad Arif and also to both of my families for their endless love, prayers and encouragements. For those who have either directly or indirectly give their contribution, I would like to say thank you. I am deeply grateful since the completion of this research paper would not have been possible without the assistance of many others. Again, my sincere appreciation goes to everyone who has helped me in their own special way. May Allah gives all of you His blessings. Thank You.

ABSTRACT

Transient stability studies are aimed at determining whether a system will remain synchronizes subsequent major disturbances such as three phase fault. Due to this, transient stability analysis is development for this project so it can determine the stability condition of power system network when disturbance occurs. The objective of this study is to understand the transient behavior of synchronous generator and method of improving its transient stability. This paper analyzed the transient stability of a power system comprising of a single generator that is connected to infinite bus. The type of fault that was introduced to the system is the three phase fault since this is the most severe type of fault encountered. The result of terminal voltage, load angle, rotor speed and the active and reactive power supplied to the grid is measured using the oscilloscopes. A comparison between the condition with and without three phase short circuit will be obtained using Matlab. Three methods are being analyzed to determine which method is the best to improve the transient stability of synchronous machine. First is to add an excitation system to the circuit. It will then be added with an additional power system stabilizer to the circuit that has excitation system installed. Finally, it will be combined with the turbine-governor control. Based on the result from the simulation, it is proven that the last method is the best method for improving stability.

Keywords: infinite bus, three-phase fault, transient stability, terminal voltage

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

As electric power systems have developed over the years, different forms of instability have been classified as being important during different periods. The existing growth in computational tools, stability theory and power system control technology will influence the methods of analysis and resolution of stability issues. An evaluation of the history of the subject is useful to enhance knowledge and understanding of the electric power industry practices with regards to system stability.

1.2 OVERVIEW ON TRANSIENT STABILITY

Power system stability was recognized as an issue ever since the 1920s whereby the characteristic structure of systems consists of remote power plants feeding load center over long distances [1]. These are some of the earliest issues as a result of inadequate synchronizing torque, where transient instability first emerged. Transient stability is defined as the ability of a power system to remain in synchronism in the matter of large transient disturbances.

The disturbance from the above statement may consist of faults on transmission elements, loss of generation, loss of load, or loss of system components such as transformers or transmission line [2]. Even though there are many types of power system stability that have been developed and become problematic along the years, it is understood that