MODELING AND SIMULATION THE TRANSIENT STABILITY ANALYSIS OF THE ST1A EXCITER MODEL USING DYNAMIC COMPUTATION FOR POWER SYSTEM (DCPS)

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

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ABSTRACT

This paper presents a modeling and simulation of the transient stability analysis of the ST1A exciter system model by using Dynamic Computation for Power system (DCPS). This study concentrates on the transient stability analysis of power system by using an ST1A exciter model. The thesis looked into the effects of using ST1A excitation system on electrical power generation system and transmission system. The thesis first explains the definition of power system stability and the need for power system stability studies. The studies also include the DCPS program. It then proceeded to discuss on the various type of excitation system. The thesis also provided a brief introduction on basic control theory and study of ST1A exciter model. Next the thesis discusses how to linerized the ST1A exciter block diagram. This thesis was using an Euler's method to design a program of ST1A exciter model. The discussions was given for each block of the exciter. The program of DCPS was used as a main of the simulation program. The thesis then performed a power system modeling and simulation of six bus test power systems. The fault was injected into the system and exciter parameters were varied to test the transient stability of the power system and the effectiveness of the ST1A as an exciter in six bus test system. Examples of the parameters that were varied include the fault position, the clearing time and the all the parameter of the exciter. Lastly, a conclusion was made on the overall effect of ST1A exciter on the power system and the transient stability of the power system when its parameters were varied.

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CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

Power system basically consists of several essential components such as generating units, the transmission lines, the loads, the transformer, the stabilizer system and lastly the HVDC lines. During the operation of the generators, there may be some disturbances such as sustained oscillations in the speed or periodic variations in the torque that is applied to the generator [8]. These disturbances may result in voltage or frequency fluctuation that may affect the other parts of the interconnected power system. This all disturbances will cause the problem to the whole of power system. This problem calls 'stability'. The Stability problem is concerned with the behavior of the synchronous machines after disturbance occur. The synchronous machine play an important role in power system, it is the machine for usual generator in power system.

For analysis purposes the stability problems are generally divided into two major categories, steady-state stability and transient stability. Steady-state stability refers to stability to the low and small disturbances. Meanwhile transient stability is deal with the effect of big or large disturbance [7]. The analysis of this stability often requires the use of small signal stability software and/or time domain simulation. The validity of the results of these packages depends greatly on the accuracy of the model parameters of the system components [2]. Figure 1.0 shows the turbine generator control loops of power system. In this system there are several power system stabilizer components, such as governor and excitation system that have an accuracy parameter to make it stable. [1].