

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background**

This project is focusing on the development of a toolbox for power system fault analysis using MATLAB. Power system fault analysis is the process of determining the magnitude of voltages and line currents during the occurrence of various types of faults. The magnitude of these currents depends on the internal impedance of the generators plus the impedance of the intervening circuit [2]. It can be of the order of tens of thousand of amperes [2]. Faults on power systems can be divided into three-phase balanced faults and unbalanced faults. Three types of unbalanced fault occurrence on power system transmission lines are single line-to-ground faults, line-to-line faults, and double line-to-ground faults. The magnitude of the fault current must be accurately calculated in order that mechanical and thermal stresses on equipment may be estimated [2]. Fault studies are used to select and set the proper protective devices and switchgears [4].

The determination of the bus voltages and line currents is very important in the fault analysis of power system. The process consists of various methods of mathematical calculation which includes loads of formula and matrix approach to determine the magnitude of the voltage and current. The calculation may form a large rows and columns of matrix depending on the number of busses. The calculation is possible when dealing with small number of busses. However it is difficult to perform

by hand when dealing with large number of busses. We will discuss the method of analysis in the methodology.

Hence, the development of this project will ease user to perform the calculations of fault analysis despite encountering large number of buses. The calculation can be easily done by computer which is generated by a program developed using MATLAB. The program will simulate the input data keyed in by the user. Graphical User Interface (GUI) will be provided with the programs. The program and the GUI will be packed in a software package performing the fault analysis study and simulation as they are the components of the toolbox which will be developed for the training and educational of power system fault analysis. The toolbox will be user-friendly and will assist the consumer whom does not have any programming background.

## **1.2 Objectives of Project**

The objective of this project is to study the common fault types which are balance and unbalance fault of the transmission line in the power system. Secondly is to perform the analysis and obtain the results from simulation on those types of fault using MATLAB. Lastly is to develop a toolbox for power system fault analysis for educational and training purposes.

## **1.3 Scopes of Project**

The scope of the project is to build a software package to assist user to perform the fault analysis calculations. The targeted user is among trainee engineer and power system students which have less experience in computer programming or C language. In order to achieve the objectives of the project, some command in MATLAB program

should be studied and understand so that the software package would operate as desired. Moreover, MATLAB GUIDE (GUI part in MATLAB) should be mastered so that user friendly software can be developed.