CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

An electrical power system consists of generators, transformers, and transmission and distribution lines [1]. The power system is subject to continual interruption initiated by random load changes, by faults produced by natural causes and at times as a result of operator or equipment breakdown. Relaying is the division of electric power engineering concerned with the fundamentals of design and operation of equipment that are called protective relays that identifies abnormal power system conditions and set up corrective operations as fast as possible in order to restore the power system to its normal state [12]. The speed of response is a fundamental element for protective relaying systems which includes transducers such as voltage transformer and current transformer and also circuit breakers. Protection is essential not only against short circuits but also against any other abnormal conditions which may arise on a power system such as overvoltage, under-frequency and many more [1].

This overview contains about information on overcurrent protection relay that will be discussed and analysed throughout this thesis. Overcurrent relay is one of a protective relay that functions when the load current surpass a pre-set rate. As for the analysis, the thesis focuses on the Inverse Definite Minimum Type (IDMT) type of IEC 60255 that are used widely for the protection of distribution lines. It been used to find out the proper settings of the overcurrent relay as a primary and backup protection, then provides a full protection coordination of the entire project. IDMT relay provides an inverse-time current
characteristics at minimum values of the fault current and with definite-time characteristics. It is obtained if the value of plug setting multiplier is below 10 [1]. Whereas if the values of plug setting multiplier between 10 and 20, the characteristics tend to become a straight line; towards the definite time characteristics [1]. A radial feeder has its own proper selectivity of the relays for overcurrent protective schemes. The relay current setting is set based on the fault current level at the chosen particular section that is to be protected. The time setting is done in a more increasing value towards the source.

The load flow analysis is required to find and investigate the characteristic of electrical power system under normal condition and evaluate the various operating states of an existing system for the commercial building based on its power factor, voltage drop and its power losses. Fault analysis also will be executed to check the fault current of the system for each busses. There are four types of fault that will be considered for short circuit analysis that are symmetrical faults or 3-phase faults, single-line to ground faults, line-to-line fault and double-line-to-ground fault. The theoretical analysis will be considered and compared with the actual result from ETAP summary report. The fault analysis is essential for the project as to determine the value of fault current at chosen protected zone.

This project presents the analysing of the load flow and fault analysis based on the actual circuit, parameter and rating of electrical equipment used from the specific chosen commercial building. The analysis include overcurrent relay and earth fault setting of the existing system and will be analysed under four types of fault situation. The manual calculation will be used to compare its result with the practical setting used for the system. The actual data use is from building of Library Universiti Malaysia Pahang, Pekan Campus. Electrical Transient Analyser Program (ETAP) software will be used as main software to simulate the load flow analysis, short circuit analysis, overcurrent relay settings and star-view feature for relay coordination.
1.2 PROBLEM STATEMENT

In this modern era, using traditional hand computational work can consume a lot of time. Thus, the complex and time consuming calculation for relay setting using conventional tool can be at highly disadvantage in electrical power system industry. Besides, especially for a large system, it is harder to identify causes for overlapping or short circuit issues in industry’s conventional method of distribution system.

1.3 OBJECTIVE

The two (2) main objectives of the project are:

i. To study and apply the practical setting method for overcurrent relay; specifically for a real commercial building system.

ii. To determine the optimum relay coordination by improving its reliability and efficiency.

1.4 SCOPES OF THE PROJECT

Several scopes for the project which are:

i. Collect real data from targeted commercial building for its system’s drawing and practical overcurrent relay settings.

ii. Do modelling of one-line diagram in ETAP software based on parameters collected and summarised from the real data.

iii. Perform load flow analysis based on system’s normal condition and estimated several conditions of switchgears.