POWER FLOW ANALYSIS FOR 30 BUS IEEE SYSTEM

Presented in partial fulfilment for the award of the

Bachelor of Electrical Engineering (Honours)

From

UNIVERSITI TEKNOLOGI MARA

MOHD HUZAIRI BIN ZAMRI
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM
SELANGOR DARUL EHSAN

ACKNOWLEDGEMENT

With the completion of this paper, I would like to give my sincere and greatest gratefulness to those who has been concerned to me all this time from start to finish, my supervisor Professor Madya Haji Muhammad Yahya, Dr. Titik Khawa Bt Abd Rahman for teaching me power system 3, my friends and especially to my beloved family for their great and continuous support in helping me completing this project. All of them have provided me with a lot of important technical materials for the purpose of improving this paper project.

ABSTRACT

This paper presents a framework that allows systematic studies on the hypothesis and derivations concerning the standard version of the Gauss-Seidel and Fast Decoupled load flow methods using C programming language. The case study of this project was to perform the power flow studies for standard 30 bus IEEE electrical power system. The 30-buses transmission system test result will be presented in this paper and is considered as a base case which enables further modification of the presented network. The typical models presented here are based on the principle that the system is balanced, i.e., only one phase is really necessary to model the system, and that phasors of voltages and currents, $V = V/\theta$ and $I = I/\theta$, can be used to represent the actual voltages and currents.

Keywords —load flow, Gauss-Seidel, Fast Decoupled, C programming.

TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION

1.1 Brief History of Power Flow Analysis [1.4]

The planning, design, and operation of a power system require continual and comprehensive analyses to evaluate current system performance and to establish the effectiveness of alternative plans for system expansion. The computational work to determine power flows and voltage levels resulting from a single operating condition for even a small network is all but insurmountable if performed by manual methods. The need for computational aids led to the design of a special purpose analog computer (ac network analyzer) as early as 1929. It provided the ability to determine flows and voltages during normal and emergency conditions and to study the transient behavior of the system resulting from fault conditions and switching operations. The earliest application of digital computers to power system problems dates back to the late 1940s. Most of the early applications were limited in scope because of the small capacity of the punched card calculators in use during that period. Large-scale digital computers became available in the mid-1950s, and the initial success of load flow programs led to the development of programs for short-circuit and stability calculations.

Gauss-Seidel method is the earliest algorithm applied in solving large systems. However, this method has relatively poor convergence characteristic. Therefore the Newton algorithm was introduced to improve the lack of convergence of the previous algorithm. It seems likely to be reliable for solving power-flow problems but was initially thought to be impractical due to computational problems with large network the solution of a matrix equation of large dimension became a problem for the iterative Newton method. In 1960s Bill Tinney and his colleagues observed that, although the system matrix was very large, it was also very sparse (it had a very small proportion of nonzero values). As a result, this observation gave rise the development of sparsity methods. The concept made it possible to apply the Newton method to systems of arbitrary size, to attain for the first time both speed and excellent convergence characteristics.