CHAPTER I
INTRODUCTION

Physical properties of reservoir fluid are necessary for various field applications, such as field development, production optimization, reservoir performance evaluation, wellbore hydraulic calculations, enhanced oil recovery processes, etc. These properties are needed to be determined at reservoir temperature with various pressures for reservoir system studies as well as at both various parameters for wellbore calculations. It can be said that the fluid properties have very strong influence over any petroleum and reservoir engineering calculations (Cannon, 2001). In general, this valuable information of reservoir fluid is obtained in the early life of reservoir through vast laboratory testing either on bottom-hole or sub-surface samples, PVT laboratory analysis and field production data. In order to acquire the accurate result from the laboratory, the reservoir fluids samples must be appropriately collected and kept for quality and representativeness of the original reservoir conditions. Extremely care and precaution must be taken from the specialized sampler since it is possible to have accurate laboratory results from poor samples, which could lead to severely fallacious unrepresentative data that can result in devastating consequences throughout the life of a reservoir (Cannon, 2001). Moreover, apart from the difficulties of inherent in the sampling measurements, these extensive procedures are very expensive and time consuming.

Since the last century, many empirical correlations of reservoir fluid properties have been developed and used in order to solve the aforementioned obstacles. Therefore, they can be incorporate with reservoir simulations or used in cases where laboratory data becomes unavailable. These correlations can predict fluid properties based on the measured data from various sources. However, these correlations fail to predict fluid properties in a wide range of conditions since the complexity of fluid composition of hydrocarbon molecules and difference crude characteristic in each area or region as well as insufficient information was available (Sutton and Farshad, 1990). Artificial neural network (ANN) can be another approach among artificial intelligence techniques for prediction of reservoir fluid physical properties. Compared to classical empirical correlation, a well trained ANN

can give better performance and in prediction of crude oil properties over wide range of conditions (Gharbi and Elsharkawy, 2003).

This study, ANNs are developed using data available in publications to predict some crude oil physical properties using crude oil parameters as input variables. The collected data are checked for quantitative and qualitative quality, and the selected data are randomly divided into data set for developing ANN, and data set for testing the ANN. Different neural model architectures are investigated and the best neural model for each property prediction are chosen. Therefore, the similar data set are used for developing new correlations to predict crude oil properties. Finally, each of the developed ANN model is compared with the developed correlation and some other published correlations using the data set for testing the model (the published correlations employed in this work are summarized in Appendix A).