CHAPTER I
INTRODUCTION

Pipeline is normally used for conveying fluid in chemical processes, but there are cases in which pipeline is not used, such as in water-power development, irrigation or city water supply, and drainage or flood control that uses channels or ditches for carrying fluid.

An open channel is the one in which the stream is not completely enclosed by solid boundaries. The principal types of open channel are natural streams or rivers, sewers, tunnels, or pipelines not completely filled. In all of these situations, the flow is characterized by an interface between the air and the upper layer of fluid, which is termed a free surface (Daugherty and Franzini, 1965).

At a free surface, the pressure is constant, and for many situations, it is atmospheric. The flow in such a channel is caused not by some external head but rather by the slope of the channel and that of the water surface. It is implied that the driving force in these cases is gravity, not the pressure drop. The gravitational force is opposed by a friction force on the solid boundaries of the channel (Fox and McDonald, 1994; Wilkes, 1999).

Generally, the elevation of the free surface does not remain constant. It can vary with the fluid velocities and the flow is often three-dimensional. Fortunately, there are many cases, such as rivers and channels, in which flows can be considered as one-dimensional with respect to the position coordinate along the streambed (Fox and McDonald, 1994; Potter and Wiggert, 1991)

Fully developed flows through a channel with constant slope and cross-section at constant depth are termed as flows at normal depth or uniform flow.

This study considers the building of a simulator for the pipeline and pump network in which some nodes are connected by pipes and channels. In the study, the flows in the channels are assumed to be steady and uniform.

The network will be specified by considering it as a number of discrete elements that are joined together at a number of nodes, at which the pressures are the typical unknowns. The material balance equations for all nodes in the network lead to a system of simultaneous nonlinear equations. The system of equations is solved by the Newton-Raphson Method, which employs an iterative solution of successive sets of simultaneous linear equations and uses the Gaussian elimination method to solve the simultaneous linear equations at each new iteration of the Newton-Raphson method. All of the volumetric flow rates in every connection are calculated when all of the unknown pressures are found.

The simulator was developed by using Microsoft Visual Basic 6.0, which is a very flexible tool for developing any program on Windows 95/98 Operating system machines. The developed program is very user-friendly and very convenient to work with.