ABSTRACT

The globalisation of economics, increased competitive pressure, heightened customer expectations, emerging technologies and multilateralism are the challenges faced by organisations in conducting their business. In order to gain competitive advantages, organisations started focusing on the logistics and supply chain management to enhance efficiency, cost effectiveness, productivity in business, along with value added service to their customer. Transportation is the main artery of logistics and supply chain management because products are rarely produced and consumed in the same location.

The mission of logistics and supply chain management is to make available the right quantity of right goods at the right time and place, at minimum cost. This can be achieved by proper planning of the movement of goods and appropriate use of transportation resources. In fact, the distribution of goods from several depots to consumption points under a time window constraint poses a significant challenge in distribution systems, including bank deliveries, postal deliveries, industrial refuse collection, franchise restaurant services and school bus routing. Hence, the vehicle routing problem with time windows (VRPTW) is an important issue arising in many practical situations and it has been the subject of intensive research for the past three decades. Since the problem is known to be NP-hard, most of the research
effort has been devoted to the development of heuristic procedures in order to provide near optimal solutions.

The main objective of this thesis is to solve the variants of the Vehicle Routing Problem, namely, the Single Depot Vehicle Routing Problem with Time Windows (VRPTW) and the Multi Depot Vehicle Routing Problem with Time Windows (MDVRPTW), with the objectives of minimizing the number of vehicles used and the distance travelled.

Genetic Algorithm, Ant Colony Optimisation, Simulated Annealing and Meta RaPS based heuristics have been developed to solve VRPTW and MDVRPTW problems. The proposed algorithms are tested with benchmark instances of both VRPTW and MDVRPTW available in the literature. The results of various algorithms developed, are presented and compared with the earlier reported literature results. These results are found to be better than the published results. Also, the algorithms developed are applied to a case study and improved results are obtained when compared to the existing solutions.