ABSTRACT

This thesis focuses on some single item/multi-item supply chain management models under precise/imprecise environments. In this dissertation, different features like credit period (full/partial), price discount policy, different types of demand, promotional cost sharing etc., are incorporated in supply chain models. Here, three single item supply chain models and four multi-item supply chain models have been developed. These models are summarized as below:

- The first model is a two level supply chain model for a deteriorating single item. In this model, it is considered that the retailer's warehouse in the market place has a limited capacity. The retailer rents an additional warehouse if needed with a higher rent. The demand of the item linearly influenced by the stock level and in case of shortages the base demand is partially backlogged. The model has been developed in both precise and imprecise (fuzzy/rough) environments.

- The second model developed for a seasonal deteriorating item where the demand of the item increases with time at the beginning of season, reaches a maximum level and then decreases gradually to normal demand at the end of the season. The demand of the item also depends on the unit selling price and promotional effort. This model is analyzed in crisp and fuzzy environment.

- The third model deals with a supplier-manufacturer supply chain under inflation and time value of money in a fuzzy planning horizon. Here, the supplier supplies raw materials to the manufacturer and the manufacturer produces the item in a production rate which is fuzzy in nature. The demand of the item depends on selling price which is also fuzzy in nature.

- The fourth model is extension of the Tsao's [184] and Huang et al.'s [78] investigations incorporating higher level of trade credit and imprecise constraints on resources after correcting the mistakes in their formulations.

- The fifth model is a multi-item two level supply chain where the supplier offers a cash discount and a credit period to its retailer to boost the demand of the items. Due to this facility, the retailer also offers a cash discount to its customers to increase the base demand of the items. This model is discussed in crisp and fuzzy environment.

- The sixth model is also a multi-item two level supply chain model. The retailer purchases different items from a wholesaler under joint replenishment policy and sells the items to its customers. The retailer uses two rented warehouses to run the business. In this model, the items are ordered jointly using basic period policy. The problem is formulated in crisp as well as imprecise environments (fuzzy, rough).

- The seventh model is a multi-item multi-level supply chain model. Here, the partial trade credit policy at each level under inflationary effect for a fixed planning horizon is considered. The wholesaler receives a partial credit period from the supplier and the wholesaler also offers a partial credit period to its retailer and in turn the retailer also offers a partial credit period to its customers to boost the base demand of any item.

Another goal of this thesis is to develop/modify the soft computing techniques for solving constrained/unconstrained optimization problems in crisp as well as imprecise environments. These techniques have been used to solve the above mentioned models, which are summarized as follows:

- A basic Particle Swarm Optimization (PSO) algorithm has been implemented and used to find the marketing decisions of some proposed models. The efficiency of the PSO is checked against a set of benchmark non-linear test functions (TFs). Also the PSO has been used tactically for the decision making in imprecise environment.

- A Multi-choice Artificial Bee Colony (MCABC) algorithm has been developed by modifying Artificial Bee Colony (ABC) algorithm and it is established that its performance is acceptable level for solving continuous optimization problems in crisp and imprecise environments. The efficiency and consistency has been checked against a set of benchmark TFs and the results are compared with the existing ABC variants.

- To solve the models of mixed-mode integer problem, MCABC is modified and this is named as Mixed-mode Multi-choice Artificial Bee Colony (MMCABC) algorithm. Some of the models have been solved using this technique. The efficiency and consistency of this technique is also verified against a set of benchmark TFs.