ABSTRACT

Research on developing inventory models for supply chain systems has gained importance because the benefits that have been realized when adopting optimal inventory policies in a supply chain are impressive. The research work reported in this thesis deals with (a) mathematical modeling for inventory control in supply chain systems under deterministic, stochastic and fuzzy environments, (b) employing profit maximization (or cost minimization) as an economic performance criterion in decision making and (c) analyzing the behaviour of the supply chain systems under different operating inventory parameters and modeling assumptions.

The supply chains under consideration consist of a supplier and single (or) multiple retailers. Since the retailer has the dominant power of controlling and influencing another member's decisions in the supply chain, in **Part -1**, optimal inventory policies are found for the retailer under deterministic environments. In chapters 3 to 6, Economic Order Quantity (EOQ) and Economic Production Quantity (EPQ) models are developed under two-echelon trade credit financing and other parametric conditions such as two-warehouse facility at the retailer, selling price and credit period dependent demand, advance payment scheme etc. In chapter 7, an EOQ model with non-instantaneous deteriorating items and a time proportional backlogging rate at the retailer is developed under delayed product differentiation process of the end-products. In these chapters, mathematical theorems are established to locate the optimal solutions. Using computational algorithms, in Matlab 7.0, total inventory cost or profit is optimized.

In **Part - 2**, two-echelon supply chain models with single supplier and multiple retailers are developed under stochastic and fuzzy environments. Chapters 8 and 9 consider the distribution-based approach where the Poisson distribution with specified mean is invoked for modeling uncertain demands and Gamma distribution is invoked for modeling lead times. Chapter 10 considers the fuzzy-based approach therein the forecast parameters such as demand, lead time, inventory costs are considered as

fuzzy numbers with accompanied membership functions. In each chapter, numerical examples are given to elucidate each model and we obtain a lot of managerial insights.