ABSTRACT

Inventory is any kind of resource having economic value and is maintained to fulfill the present and future needs of an organization. An inventory problem is a problem in making optimal decisions with respect to inventory system. In other words, an inventory problem is concerned in making decisions that minimize the total cost of an inventory system. Inventory control has attained much importance in recent years because of changing business environment and role played by mathematical concepts in decision making. The approach in this thesis is based on modeling of the inventory problems and finding out the optimal replenishment policy by using optimization techniques. The goal of this research work is to present the results involved in controlling the inventory system.

In this thesis, various inventory models under single or two-warehouse systems are developed for single item. In our models, demand is considered as a constant or sales team’s initiatives dependent or stock dependent or price and advertisement dependent. Inventory models with finite and infinite planning horizon under inflation are developed. Due to the period of maintaining quality or their original condition, items are classified into perfect items, instantaneous deteriorating items and non-instantaneous deteriorating items. The concept of deterioration plays a vital role and is taken into account. Permissible delay in payments is the backbone of any business. Suppliers usually offer permissible delay period to their retailers. To be more realistic, this concept is also taken into
account while framing the models. When the deteriorating and perishable items such as food products are kept in storage, the more complicated the storage facilities and services needed, and therefore, the higher the holding cost. Hence, the holding cost may be varying according to time. This concept is proposed in the inventory model in this treatise. In the production system, production rate and cost are changed due to increased equipment wear, greater defect rates, raw material, number of labours, production procedure, firm size, quality of the product, etc. Hence our proposed model encourages the manufacturer to consider the unit production cost which is dependent on the cost of raw materials, labour charges, advertisement cost, produced units, etc. In this thesis, various inventory models with shortages or without shortages are considered. When shortages occur, they are partially backlogged and this backlogging rate may be waiting time-dependent. The necessary and sufficient conditions for the existence and uniqueness of the optimal solutions are also provided. In general, algorithms and solution procedures are designed for all the developed models to find the optimal solutions. Numerical illustrations aid in demonstrating theoretical results and solution procedure. Sensitivity analysis of the optimal solution with respect to major parameters is carried out.