

## CHAPTER 31

### MATHEMATICAL SCIENCES OPERATIONAL RESEARCH

#### Doctoral Theses

384. AGGARWAL (Sugandha)  
**Study of Modelling and Optimization Applications for Promotional Planning.**  
Supervisor : Prof. P. C. Jha  
Th 22576

#### *Contents*

1. Introduction 2. Innovation diffusion models with segment specific and spectrum effect of promotion 3. Optimal duration for promotion of a durable technology product 4. Media planning in a segmented market through segment specific and mass media 5. dynamic media planning in a segmented market. Conclusion, bibliography and appndix.

385. ALOK KUMAR  
**Modeling Framework for Coordinating Inventory and Marketing Decisions.**  
Supervisors : Prof. Chandra K. Jaggi and Dr. K. K. Aggarwal  
Th 22267

Inventory Management is one of the most important wing of Operational Research. The fundamental objectives of inventory management are to reduce the investment in inventories by examining the causes of excessive stocking and taking appropriate measures to bring down stock to a desired limit. There are some basic questions which are relevant to the inventory management such as what to order, when to order, how much to order and whom to order. These questions are best dealt with when one uses the concept of effective inventory management. Therefore, the effective inventory management is essential for any organization for its smooth functioning. The inventory models developed in the inventory management field are highly perceptive to its demand pattern because estimating or predicting the appropriate demand pattern helps the decision maker to a great extent while formulating the procurement policy of the inventories. The present thesis entitled “A Modeling Framework for Coordinating Inventory and Marketing Decisions” has been divided into five chapters as described below. First Chapter being an introductory section, it provides a brief overview of the research done in the field of inventory management. Second Chapter presents the Economic Ordering Policies for New Products under Innovation Diffusion Process. This chapter is divided into two sections. Third Chapter presents the Determination of Inventory and Promotion Policy under Innovation Diffusion process. This chapter is divided into three sections. Fourth Chapter presents the Inventory and Pricing Policies under Innovation Diffusion Criterion. This chapter is divided into two sections. Fifth Chapter presents Economic Ordering Policies for New Products under Fuzzy

Environment. This chapter is divided into two sections. Conclusion of the work done and an elaborate list of references is presented at the end of the thesis.

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1. Introduction 2. Economic ordering policies for new products under innovation diffusion process 3. Impact of credit and advertisement policies on inventory decisions for new products 4. Inventory and pricing policies for new product adoption 5. Economic ordering policies for new products under Fuzzy Environment. Conclusion. List of papers published and communicated. Bibliography.

386. GANDHI (Kanika)  
**Study of Optimization Models in supply chain for deteriorating Products Under fuzzy Environment**  
Supervisor : Dr. P. C. Jha  
Th 22266

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1. Introduction 2. Procurement - distribution coordination for single source - Single destination supply chain network 3. Procurement - Distribution coordination for source - Destination supply chain network 4. BI criteria supplier evaluation approach to procurement - distribution coordination in supply chain network 5. BI criteria supplier evaluation approach to procurement - distribution coordination in multi echelon supply chain network. Conclusion. References. Appendix.

387. SHARMA (Anuj Kumar)  
**Inventory Decisions Under Fuzzy Environment with Different Credit Terms.**  
Supervisor : Prof. Chandra K. Jaggi  
Th 22577

The importance of inventory management systems is growing every day and many researchers are trying to solve management problems using mathematical models. The economic order quantity (EOQ) model is the basis of advanced inventory systems. In traditional inventory models, it was tacitly assumed that the supplier is paid for the items as soon as the items are received by the buyer. But in real practice, supplier often offers trade credit to the buyer. It is observed that the trade credit offered by the supplier encourages the buyer to buy more and it is also a powerful promotional tool that attracts new customers who consider it as an alternative incentive policy to quantity discounts. Hence, trade credit plays an important role in inventory management for the both supplier as well as buyer. Among various paradigmatic changes in Mathematics, one may concern with the art of dealing with the concept of uncertainty. Uncertainty is an important contributor to create hurdles in decision making problems. Classically, uncertainty was dealt by statistical approach only. But this approach is observed to be more useful in cases of randomized uncertainties. Basically in real life problems uncertainties based on vagueness are more predominant. Although crisp models offer an overview of the approach of

inventory systems under various assumptions, they are not able to provide factual terms. As a result, exerting crisp models in general can lead to errors in decision-making. Also, in crisp models, inventory managers must be flexible in determining the economic lot size to cause non-random uncertainty based cost reduction. The present thesis entitled “Inventory Decisions under Fuzzy Environment with Different Credit Terms” explores inventory models in crisp and fuzzy environment under with generalized payment conditions.

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1. Introduction 2. Literature review 3. Retailer’s optimal policies with permissible delay in payments under fuzzy environment 4. Optimal decisions with allowable shortages under different financial scenario of trade credit 5. Retailer’s optimal policies under trade credit with generalized payment conditions 6. Retailer’s optimal policies with permissible delay in payments under fuzzy environment 7. conclusion and recommendation for future research. Bibliography.

388. SHARMA (Deepmala)  
**Some Optimum Accelerated Life Test Sampling Plans.**  
Supervisor : Dr. Preeti Wanti Srivastava  
Th 22268

#### *Contents*

1. An introduction to accelerated life test sampling plans 2. Optimum ramp-stress ALTSPS for the log-logistic distribution under censoring 3. Optimum time-censored constant-stress PALTSP for the burr type XII distribution using tampered failure rate model 4. Optimum time-censored step-stress PALTSP for the burr type XII distribution with warranty using tampered failure rate model 5. Optimum time censored ramp-stress ALTSP for the burr type XII Distribution with periodic inspection and warranty 6. Optimum time-censored step-stress PALTSP with competing causes of failure using tampered failure rate model. Future scope. Appendix. References.

389. TIWARI (Sunil)  
**Inventory Strategies for Deteriorating Items in Two Warehouse System.**  
Supervisor : Prof. Chandra K. Jaggi  
Th 22578

The need for effective inventory management is more of a necessity when customer satisfaction and services have become a major reason for businesses to survive in this competitive environment. Earlier the main motive of inventory management was to find optimal order quantity i.e., when to order and how much to order. However, with increased global scope and network changes, it has been observed in the last few decades that the objectives of the supplier and the retailer go hand in hand, and are not limited only to these two questions. The decisions regarding the type of items to be ordered, and subsequently where to store these items, are also very crucial for effective inventory control. Thus, in such situations warehouse operation and management plays a pivotal role in manufacturing and retail industry. In real life scenario, vendors adopt certain marketing strategies (price discounts, credit period and

incentives) or when the products are seasonal, the buyers opt for bulk purchases and they rely on a rented warehouse (RW) as an alternative to store the excess units when there is a capacity restriction on the own warehouse (OW). Further ahead, the purpose of rented warehouse is not only to store the excess units; but also to provide better storage facilities for the deteriorating items, so as to reduce the amount of deterioration. The present thesis entitled “Inventory Strategies for Deteriorating Items in Two Warehouse System” presents different inventory models with two-warehouse system under various realistic situations e.g. deterioration (instantaneous and non-instantaneous), stock-outs (full and partial), price dependent demand, time dependent holding cost, inflation, time value of money, FIFO and LIFO dispatch policy, trade credit policies, imperfect quality items etc. This study aims to explore and extend the previous research in two-warehouse environment contributing to develop more applicable and realistic models.

### *Contents*

1. Introduction 2. Literature review 3. Two warehouse inventory model for non-instantaneous deteriorating items 4. Optimal decisions for non-Instantaneous deteriorating items in two warehouse environment under trade credit 5. Two-warehouse inventory model for non-instantaneous deteriorating items under inflationary condition 6. Two warehouse inventory model for deteriorating items with imperfect quality 7 conclusion and recommendation for future research. Appendix, list of publication and bibliography.

390. TYAGI (Arun Kumar)  
**Study for Coordinating Inventory and Credit Decisions.**  
Supervisor : Prof. K. K. Aggarwal  
Th 22579

Inventory problem emerges when there is a necessity to stock some physical goods for the purpose of satisfying its demand over a period of time. The existence of credit (i.e. pay-later system) is quite common in every sector of economy. Trade credit is widely used as a management tactics to influence the buying behavior of purchasers; it also influences inventory decisions because demand is influenced by it. Credit policy through its impact on demand becomes a determinant of inventory decisions so inventory and credit decisions must be coordinated and should be determined simultaneously in a systems perspective. The focus of the thesis is to develop the mathematical models that provide insight into the interaction between inventory and credit granting strategies from viewpoint of the provider of trade credit. The models have been developed when firm gives either day-terms credit or date-terms credit to its customers. The models are also developed by taking into account the non-payment losses from the credit sales as well as two levels of credit financing. The models are developed using discounted-cash-flow (DCF) approach in order to incorporate the time value of money. The cost of giving credit i.e. accounts receivable cost is included in the models. Variety of credit-linked demand functions are used to develop the models. The models are numerically validated and comprehensive sensitivity analysis is performed. The thesis is organized into five chapters. As a general rule the models developed in the thesis suggest that at high values of operating costs, i.e. inventory

carrying cost and accounts receivable carrying cost, the firm should follow a more stringent credit policy in setting its inventory levels and vice-versa. The conclusion of the work done, scope of future research and list of references are presented at the end of the thesis.

### *Contents*

1. Introduction 2. Coordinating inventory and credit decisions with day-terms credit policy 3. Optimal inventory and credit decisions with date-terms credit policy 4. Inventory control and credit granting strategies with allowance for bad-debts 5. Economic ordering and credit granting policies under two levels of credit financing . Conclusion, scope for future research, list for papers published and communicated and References.