Preface

Failure is an unavoidable phenomenon with technological products and systems. Reliability is a measure of failure uncertainty. Reliability plays a key role in monitoring the quality of various systems which is primarily due to the complexity, sophistication, and automation inherent in modern technology. Evidently, the question of selecting the best product or system in terms of multifarious characteristics, *viz.*, reliability, length of lifetime, *etc.*, arises. In the thesis, we have analyzed system behavior by probability and possibility distributions. Stochastic orders and aging classes are being used at an accelerate rate in the study of various distributions and systems. The literature of reliability theory reveals that there is a good scope to carry out further research on several problems of orderings and aging properties of lifetime distributions that are applicable for modelling and analysis of failure time data, and also on a fuzzy reliability theory, namely, posbist reliability based on fuzzy variables. The present thesis is devoted to the study of these.

As a sense of fulfilment at the completion of this phase of academic endeavor, I find worthy to pay salutary reminders to the goodwill, assistance and encouragement received from various quarters during the course of my research.

At the outset, I offer my respectful obeisances to my research supervisors, Prof. S. S. Alam, and Dr. Asok K. Nanda, Department of Mathematics, IIT Kharagpur for their unfailing patience, deeply felt and beautifully explained work, that has become a memorable experience for me and inspired me for completion of this phase of research work. Dr. Asok K. Nanda is acknowledged, in particular, for introducing me to this fascinating area of research topic. With his enthusiasm and masterly guidance, he helped me in understanding the topic better. I am thankful to Almighty for assigning such a research supervisor.

I am indebted to Prof. Moshe Shaked, Department of Mathematics, University of Arizona, USA, for having imparted constructive suggestions and comments, leading to fruitful results. I am also grateful to Prof. K. B. Misra, Reliability Engineering Center, Indian Institute of Technology Kharagpur, Dr. Pawan Kumar, Department of Mathematics, Indian Institute of Technology Kharagpur for their kind help during the period of my stay and the submission of thesis work.

I would like to express my sincere thanks to Prof. S. S. Alam and Prof. S. Nanda, the present and the former Heads of the Department of Mathematics, who provided me with all facilities to carry out my doctoral research. The financial support provided by Indian Institute of Technology Kharagpur is gratefully acknowledged.

I take this opportunity to salute Prof. Shyam Sadhan Mukherjee (retired teacher of Presidency College, Calcutta) who instilled in me to love Mathematics through proper motivation. I offer my sincere thanks to my esteemed colleagues and respected Principal of M.C.K.V. Institute of Engineering, Liluah (Howrah), for their support and help.

Last but not the least, I thank and express my deep sense of gratitude to my parents and my friends for their blessings, love, patience and all-the-time encouragement.

IIT, Kharagpur (Subarna Bhattacharjee)
August, 2006