The main objectives of the present research work are concerned with the study on some generalizations of Marshall-Olkin family of distributions like Fréchet, Lindley, Pareto, Rayleigh etc and their applications in various areas such as reliability analysis, record value theory, acceptance sampling, etc. We consider three different generalizations of the Marshall-Olkin family namely the Exponentiated Marshall-Olkin family, Negative Binomial Extreme Stable family and Harris Extended family of distributions.

Chapter 1 is an introductory one with a review of literature and a brief summary of the thesis. In chapter 2, we concentrate on the Marshall-Olkin Exponentiated Generalized Exponential distribution and its applications. Various properties are explored. The maximum likelihood estimates are obtained and the models are applied to a real data set on carbon fibers. Stress-strength analysis with respect to the model is also carried out. R programs necessary for computation are also developed.

Chapter 3 deals with a new distribution namely, Marshall-Olkin Exponentiated Generalized Fréchet distribution and its applications. Quantiles and order statistics of the distributions are obtained. Estimates of the parameters of the distribution are obtained and applied to a real data set. Reliability of a system following the new distribution under stress-strength model is estimated and simulation studies are carried out for establishing the validity of the estimates. The R program developed is also given.

In Chapter 4, we introduce the Exponentiated Marshall-Olkin Exponential and Weibull distribution. Various properties are studied including quantiles, order statistics, record values and Renyi entropy. Estimation of parameters is also considered. A real data set is analyzed as an application. Chapter 5 deals with the Negative binomial extreme stable Marshall-Olkin extended Lindley distribution and its properties. We consider the properties of Extended Lindley distribution. The expression for quantiles and the distribution of order statistics are derived. Distribution of the record values is obtained. The maximum
likelihood estimates are obtained and applied to a real data set on failure times of air conditioning system of an air plane.

Chapter 6 concentrates on Negative binomial extreme stable Marshall-Olkin Pareto distribution. We develop reliability test plans for acceptance or rejection of a lot of products submitted for inspections with lifetime following the new distribution. The results are illustrated by numerical examples. In chapter 7, we introduce a new distribution namely, the Negative binomial Marshall-Olkin Rayleigh distribution. Various properties are discussed. Maximum likelihood estimates are obtained and applied to a real data set on remission times of bladder cancer patients. The results are useful in constructing a suitable sampling plan for a product with the new distribution as lifetime.

Chapter 8 deals with a new generalized family called the Harris Extended family of distributions which generalize the Marshall-Olkin family. We consider in detail the Harris extended Burr XII and Exponentiated Exponential distribution. Its properties are derived. Quantiles and order statistics of the distributions are obtained. Maximum likelihood estimates are obtained. The superiority of the new models are established by applying the results to two real data sets on the exceedances of flood peaks of the Wheaton River and the failure times of electronic components in an accelerated life test respectively.