GROUP-SCREENING DESIGNS

By

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This thesis is my original work and has not been presented for a degree in any other University.

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This thesis has been submitted for examination with my approval as the University Supervisor.

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SUMMARY OF CONTENTS

The problem of finding defective factors out of a large population consisting of defective and non-defective factors is well known in literature. Designs used in this kind of investigation are known as screening designs. Earlier work in this area was done by Dorfman [3] and Sterrett [16]. Connor [1], Watson [18] and Patel [9], [10], [11] approached the problem from the point of view of designs of experiments and called these designs, "Group-Screening Designs". This thesis is an extension of Watson's paper [18] which is a study of a two-stage group-screening design with equal a-priori probabilities.

Chapter I defines the concept of group-screening designs and describes briefly the work done in the area or in the areas related to it by several authors in the past. The chapter also indicates thedeviations from the traditional assumptions and other work presented in this thesis.

In Chapter II, a discrete approach to group-screening designs in the sense of discontinuous variation in the sizes of group-factors has been studied. The results obtained, using the finite difference method are compared with Watson's results obtained by assuming continuous variation.

In Chapter III, the optimum sizes of the group-factors have been determined taking into account both the expected number of runs and the expected number of incorrect decisions. To balance the opposite trends of the expected number of runs and the expected number of incorrect decisions, a cost function has been introduced and the optimum size of the group-factors determined by minimizing the cost function.

In Chapter IV, the probabilities of all factors not having the same a-priori probability of being defective has been fully investigated. In fact, it has been shown that in the case of group-screening with unequal a-priori probabilities, the number of observations (runs) needed on the average to sort out defective factors from non-defective is considerably smaller than that required in the case of all factors having the same a-priori probabilities of being defective.

Finally in Chapter V, just as in Chapter III. optimum sizes of group-factors are determined by taking into account both the expected number of runs and the expected number of incorrect decisions. In this case, since the group-factors have unequal a-priori probabilities of being defective, the sizes of these grou-factors are expected to be unequal. The optimum sizes of the group-factors have also been determined by using the appropriate cost functions.

At the end, we have, in the Appendices, a series of tables which show some group-screening plans which result from the work that has been done in Chapter II through V.

Most of the problems in this thesis have been solved using the ordinary calculus techniques, such as Newton-Raphson iterative method, the method of Lagrange's multipliers, etc. Problems which need the linear programming techniques have also been stated.