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NESTED BALANCED TERNARY, QUATERNARY AND PARTIALLY BALANCED TERNARY RECTANGULAR DESIGNS AND THEIR APPLICATIONS

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Abstract

This paper is concerned with the recursive construction of nested balanced ternary (NBT), nested balanced quaternary (NBQ) and partially balanced ternary rectangular (PBTR) designs through a set of balanced incomplete block (BIB) designs. An illustrative example in each case has been added separately. The efficiency of NBT and NBQ designs has also been computed.

Key Words: Balanced Incomplete Block (BIB) Design; Incidence Matrix; Nested Balanced Ternary (NBT) Design, Nested Balanced Quaternary (NBQ) Design, Partially Balanced Ternary Rectangular (PBTR) Design.

1. Introduction

The heterogeneity of experimental material should be taken care of critically in designing of an experiment; otherwise the real treatment differences remain undetected, unless they are large enough. The blocking is a kind of technique which is used to bring about homogeneity of experimental units within block for the case of one way elimination of heterogeneity, so that treatment contrasts can be estimated. Due to the presence of multiple factors of heterogeneity, blocking alone in one direction may fail to remove such heterogeneity.

Preece (1967) introduced a class of designs, called nested balanced incomplete block designs, in which ,within each block there is one nuisance factor nested. This idea has been generalized to nested partially balanced incomplete block deigns by Homel and Robinson (1975). The various constructions of such nested designs have been considered in Dey (1986), and Banerjee and Kageyama(1990). It is to be noted that in the nested designs constructed in the literature, the sub blocks and super –blocks have the same association scheme.

Vartak (1955) introduced the concept of rectangular designs which are 3 –associate partially balanced incomplete block(PBIB) designs based on a rectangular association scheme of v=mn treatments arranged in an mxn rectangle such that with respect to each treatment, the first associates are the other n-1 (n_1, say) treatments of the same row, the second associates are the other m-1 (=n_2 say) treatments of the same columns and the remaining (m-1)(n-1) (=n_3 say treatments of the 3rd associates).

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