Abstract

Experimental Design plays a very important role on establishing an interface between Applied Mathematics and statistical applications in several fields, like Agriculture, Industry, Genetics, Biology and Education Sciences. The goal of any Experimental Design is to obtain the maximum amount of information for a given experimental effort, to allow comparisons between varieties and to control for sources of random variability. Randomized block designs is one way used to control for sources of variability in experiment. A Balanced Incomplete Block design (BIBD) is a randomized block design denied as an arrangement of v treatments in b blocks such that any treatment occurs in r blocks, any block has k treatments and any pair of treatments occurs in _ blocks and is one of the designs widely used in the analysis of yields in Agricultural experiments. Due to its importance, its analysis and construction have been studied by a number of researchers and only necessary conditions for existence of BIB designs have been established. However, the existence or non-existence of some of these designs is sometimes not known even if their parameters satisfy the necessary conditions. In this study a new condition has been established that is sufficient for the existence of a symmetric (v; k; _)-BIB design with _ = 1. Besides, it has also clearly shown that every symmetric design with _ = 1 exists. This study has also established that if a symmetric BIB design does not exist then it implies no design corresponding to parameters of a Set $v_{00} = v\square k$; $b_{00} = b\square 1$; $r_{00} = r$; $k_{00} = k\square\_$; $\_{00} = \_$ exists. Therefore, other than the necessary conditions given for the existence of a BIB design, which do not guarantee the existence of a BIB design even when they are satisfied, this study has established sufficient conditions for their existence or non-existence. Thus the study has bridged the gap of known BIB designs and pa-rameters satisfying these necessary and sufficient conditions for their existence or non-existence leading to the ease of construction of the designs.