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# Constructions of Balanced Incomplete Block Design Generation (127, 2667, 63, 3, 1)

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**Abstract:** ***The aim of this article is to constructa balanced incomplete block design by using the Greedy algorithm.Block designs play an important role in the area of statistical experiment design under some conditions in order to examine optimal design. Additionally, the main advantages of applying experimental design is to decrease systematic variation and enhance the accuracy of impact prediction. Balanced incomplete blocks designs (BIBD) as a type of block designs can be considered for the situations in which same number of every block and application level exist.Also, BIBD generation is a NP-hard problem that provides an excellent benchmark since it is scalable and has a wide variety of problem instances.***

**Keywords:** Balanced incomplete block design, greedy algorithm, design theory

## 1. Introduction

Block design theory is one of the most important fields in Combinatorial Mathematics. The basic principles of Combinatorial block design theory isclosely related to the statistical theory of experimental design, as well as to the 19th century's recreational mathematics and geometry. The applications of Combinatorial block design is widely used in graph theory, coding theory, theoetical computer science, statistics, and algebra, among others.The main problems in design theory are, generally speaking, those of the existence, enumeration and classification, structural properties, and applications [7].

Balanced incomplete block designs (BIBD) is developedby Yates in 1936. The topic of balanced incomplete block designs and its combinatorial problems have been attractive to combinatorists and algebraists as well as to statisticians.
There are a number of methods for the construction of balanced incomplete block designs which have been investigated. The simplest examples are all the sets of $k$out of $v$varieties. These are called the unreduced designs [3].

BIBD generation is a NP-hard problem that provides an excellent benchmark since it is scalable and has a wide variety of problem instances, ranging from easy instances to very difficult ones. The scalability of the problem as well as its difficulty make it an adequate setting to test the behavior of different techniques/algorithms [8]

## 2. Balanced incomplete block designs

A Balanced Incomplete Block Design (BIBD) with parameters $(v, b, r, k, \lambda)$ is a pair $(X, B)$ , where $X$is a set, $B$ is a collection of subsets of $X$ and the five parameters are defined as follows:

$v$is elements of $X$ , $b$(block number) is the number of elements of $B$, $r$(replication number) is the number of blocks to whichevery point belongs , $k$(block size) is the common size of each block, $\lambda$ is the number of blocks to which every pair ofdistinct points belongs

The five parameters are integers and are not independent.

$vr = bk$ and $\lambda(v-1) = r(k-1)$
$r = \frac{\lambda(v-1)}{k-1}$ and $b = \frac{\lambda v(v-1)}{k(k-1)}$must be integers. the necessary conditions for the existence of a BIBD but is not sufficient. For example, The parameters (22, 33, 12, 8, 4) provide the above conditions. However, the existence of such a BIBD design has not yet been demonstrated. [5 , 6]

Consider a balanced incomplete block design withparameters $v, b, r, k, \lambda$. Let $n_{ij}$ = 1 or 0 according to the $i$th variety does or does not occur in the $j$th block. That is, $n_{ij}$ denotes the number of times that the$i$th variety appears in the $j$th block. It is easy to see that$N = (n_{ij})$is the incidence matrix of the design. It has $v$rows and $b$columns.

$$N = \begin{bmatrix} n_{11} & \cdots & n_{1b} \\ \vdots & \ddots & \vdots \\ n_{v1} & \cdots & n_{vb} \end{bmatrix}$$

Let $B_1, B_2, \cdots, B_b$blocks and $P_1, P_2, \cdots, P_v$
BIBD (7,7,3,3,1)
$P_1 = 1, P_2 = 2, P_3 = 3, P_4 = 1, P_5 = 5$

$P_6 = 6, P_7 = 7$

$B_1 = \{1, 2, 3\}$ , $B_2 = \{1, 4, 5\}$ , $B_3 = \{1, 6, 7\}$

$B_4 = \{2, 4, 6\}$ , $B_5 = \{2, 5, 7\}$ , $B_6 = \{3,4, 7\}$

$B_7 = \{3, 5, 6\}$

$$N = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{array} \begin{array}{c} \begin{array}{ccccccc} B_1 & B_2 & B_3 & B_4 & B_5 & B_6 & B_7 \end{array} \\ \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}$$

### 2.1 Statistical analysis

Balanced incomplete block designs are typically used when all comparisons are equally important for the experiment, but the researcher is not able to run all possible combinations. In such cases, the treatments that are used in each block should be selected in *balanced manner*, i.e. any pair occurs together in the same number of times as any other pair [4]

Consider a BIBD $(v, b, r, k, \lambda)$.The statistical model for this design is given by:

$$Y_{ij} = \mu + \beta_i + \alpha_j + \varepsilon_{ij} \quad \begin{matrix} i = 1,2,\cdots v \\ j = 1,2,\cdots, b \end{matrix}$$

$y_{ij}$ : the $i^{th}$ observation in the $j^{th}$ block
$\mu$: General mean effect
$\beta_i$: The effect of $i^{th}$ treatment
$\alpha_j$: The effect of $j^{th}$ block
$\varepsilon_{ij} \sim IND(0, \sigma_\varepsilon^2)$: i.i.d random error component

## 3. Construction of BIBD(127,2667,63,3,1)

The BIBD problem has been tackled by a number of different techniques in the literature with different success. In this article, a balanced block design was created with the Greedy algorithm.

The k-element subsets and the m-element subsets of the v-element X-set are listed as lexicographic. After selecting the first block from the k-element subsets, the associated block is added to the design after determining the ones associated with the number of $t$from the m-element subsets. The sub-sets m are common with the k-element subsets and the number $t$ are subtracted from the order. Then the block in the new sequence is taken and this process is continued sequentially. In m-element subsets, the algorithm is stopped when no elements are compared.

When applying the algorithm, the first block in the sequence was taken and the blocks represented by this block were removed from the order. Then, the first block in the remaining sequence was taken and similar operations were repeated. The algorithm is stopped when no sequence is left [2]

## 4. Conclusion

The construction of BIBD for some particular parameters combinations still remain unsolved. There are a number of methods for the construction of balanced incomplete block designs. In this article(127,2667,63,3,1) design can be obtained by the Greedy algorithm. In general , for $n \geq 2$parameters $v = 2^n - 1$ , $b = \frac{v(v-1)}{2}$, $r = 2^{n-1} - 1$ ,

$k = 3$ and $\lambda = 1$ designs can be obtained by the Greedy algorithm. Current "best" covers have been collectedby Center for Communications Research ,www.ccrwest.org.

**Table 1:** Blocks of BIBD (127,2667,63,3,1)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 2 | 4 | 6 | 3 | 5 | 6 |
| 1 | 4 | 5 | 2 | 5 | 7 | 3 | 8 | 11 |
| 1 | 6 | 7 | 2 | 8 | 10 | 3 | 9 | 10 |
| 1 | 8 | 9 | 2 | 9 | 11 | 3 | 12 | 15 |
| 1 | 10 | 11 | 2 | 12 | 14 | 3 | 13 | 14 |
| 1 | 12 | 13 | 2 | 13 | 15 | 3 | 16 | 19 |
| 1 | 14 | 15 | 2 | 16 | 18 | 3 | 17 | 18 |
| 1 | 16 | 17 | 2 | 17 | 19 | 3 | 20 | 23 |
| 1 | 18 | 19 | 2 | 20 | 22 | 3 | 21 | 22 |
| 1 | 20 | 21 | 2 | 21 | 23 | 3 | 24 | 27 |
| 1 | 22 | 23 | 2 | 24 | 26 | 3 | 25 | 26 |
| 1 | 24 | 25 | 2 | 25 | 27 | 3 | 28 | 31 |
| 1 | 26 | 27 | 2 | 28 | 30 | 3 | 29 | 30 |
| 1 | 28 | 29 | 2 | 29 | 31 | 3 | 32 | 35 |
| 1 | 30 | 31 | 2 | 32 | 34 | 3 | 33 | 34 |
| 1 | 32 | 33 | 2 | 33 | 35 | 3 | 36 | 39 |
| 1 | 34 | 35 | 2 | 36 | 38 | 3 | 37 | 38 |
| 1 | 36 | 37 | 2 | 37 | 39 | 3 | 40 | 43 |
| 1 | 38 | 39 | 2 | 40 | 42 | 3 | 41 | 42 |
| 1 | 40 | 41 | 2 | 41 | 43 | 3 | 44 | 47 |
| 1 | 42 | 43 | 2 | 44 | 46 | 3 | 45 | 46 |
| 1 | 44 | 45 | 2 | 45 | 47 | 3 | 48 | 51 |
| 1 | 46 | 47 | 2 | 48 | 50 | 3 | 49 | 50 |
| 1 | 48 | 49 | 2 | 49 | 51 | 3 | 52 | 55 |
| 1 | 50 | 51 | 2 | 52 | 54 | 3 | 53 | 54 |
| 1 | 52 | 53 | 2 | 53 | 55 | 3 | 56 | 59 |
| 1 | 54 | 55 | 2 | 56 | 58 | 3 | 57 | 58 |
| 1 | 56 | 57 | 2 | 57 | 59 | 3 | 60 | 63 |
| 1 | 58 | 59 | 2 | 60 | 62 | 3 | 61 | 62 |
| 1 | 60 | 61 | 2 | 61 | 63 | 3 | 64 | 67 |
| 1 | 62 | 63 | 2 | 64 | 66 | 3 | 65 | 66 |
| 1 | 64 | 65 | 2 | 65 | 67 | 3 | 68 | 71 |
| 1 | 66 | 67 | 2 | 68 | 70 | 3 | 69 | 70 |
| 1 | 68 | 69 | 2 | 69 | 71 | 3 | 72 | 75 |
| 1 | 70 | 71 | 2 | 72 | 74 | 3 | 73 | 74 |
| 1 | 72 | 73 | 2 | 73 | 75 | 3 | 76 | 79 |
| 1 | 74 | 75 | 2 | 76 | 78 | 3 | 77 | 78 |
| 1 | 76 | 77 | 2 | 77 | 79 | 3 | 80 | 83 |
| 1 | 78 | 79 | 2 | 80 | 82 | 3 | 81 | 82 |
| 1 | 80 | 81 | 2 | 81 | 83 | 3 | 84 | 87 |
| 1 | 82 | 83 | 2 | 84 | 86 | 3 | 85 | 86 |
| 1 | 84 | 85 | 2 | 85 | 87 | 3 | 88 | 91 |
| 1 | 86 | 87 | 2 | 88 | 90 | 3 | 89 | 90 |
| 1 | 88 | 89 | 2 | 89 | 91 | 3 | 92 | 95 |
| 1 | 90 | 91 | 2 | 92 | 94 | 3 | 93 | 94 |
| 1 | 92 | 93 | 2 | 93 | 95 | 3 | 96 | 99 |
| 1 | 94 | 95 | 2 | 96 | 98 | 3 | 97 | 98 |
| 1 | 96 | 97 | 2 | 97 | 99 | 3 | 100 | 103 |
| 1 | 98 | 99 | 2 | 100 | 102 | 3 | 101 | 102 |
| 1 | 100 | 101 | 2 | 101 | 103 | 3 | 104 | 107 |
| 1 | 102 | 103 | 2 | 104 | 106 | 3 | 105 | 106 |
| 1 | 104 | 105 | 2 | 105 | 107 | 3 | 108 | 111 |
| 1 | 106 | 107 | 2 | 108 | 110 | 3 | 109 | 110 |
| 1 | 108 | 109 | 2 | 109 | 111 | 3 | 112 | 115 |
| 1 | 110 | 111 | 2 | 112 | 114 | 3 | 113 | 114 |
| 1 | 112 | 113 | 2 | 113 | 115 | 3 | 116 | 119 |
| 1 | 114 | 115 | 2 | 116 | 118 | 3 | 117 | 118 |
| 1 | 116 | 117 | 2 | 117 | 119 | 3 | 120 | 123 |
| 1 | 118 | 119 | 2 | 120 | 122 | 3 | 121 | 122 |
| 1 | 120 | 121 | 2 | 121 | 123 | 3 | 124 | 127 |
| 1 | 122 | 123 | 2 | 124 | 126 | 3 | 125 | 126 |
| 1 | 124 | 125 | 2 | 125 | 127 | 4 | 8 | 12 |
| 1 | 126 | 127 | 3 | 4 | 7 | 4 | 9 | 13 |
| 4 | 10 | 14 | 5 | 17 | 20 | 6 | 24 | 30 |
| 4 | 11 | 15 | 5 | 18 | 23 | 6 | 25 | 31 |
| 4 | 16 | 20 | 5 | 19 | 22 | 6 | 26 | 28 |

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|---|---|---|---|---|---|---|---|---|
| 4 | 17 | 21 | 5 | 24 | 29 | 6 | 27 | 29 |
| 4 | 18 | 22 | 5 | 25 | 28 | 6 | 32 | 38 |
| 4 | 19 | 23 | 5 | 26 | 31 | 6 | 33 | 39 |
| 4 | 24 | 28 | 5 | 27 | 30 | 6 | 34 | 36 |
| 4 | 25 | 29 | 5 | 32 | 37 | 6 | 35 | 37 |
| 4 | 26 | 30 | 5 | 33 | 36 | 6 | 40 | 46 |
| 4 | 27 | 31 | 5 | 34 | 39 | 6 | 41 | 47 |
| 4 | 32 | 36 | 5 | 35 | 38 | 6 | 42 | 44 |
| 4 | 33 | 37 | 5 | 40 | 45 | 6 | 43 | 45 |
| 4 | 34 | 38 | 5 | 41 | 44 | 6 | 48 | 54 |
| 4 | 35 | 39 | 5 | 42 | 47 | 6 | 49 | 55 |
| 4 | 40 | 44 | 5 | 43 | 46 | 6 | 50 | 52 |
| 4 | 41 | 45 | 5 | 48 | 53 | 6 | 51 | 53 |
| 4 | 42 | 46 | 5 | 49 | 52 | 6 | 56 | 62 |
| 4 | 43 | 47 | 5 | 50 | 55 | 6 | 57 | 63 |
| 4 | 48 | 52 | 5 | 51 | 54 | 6 | 58 | 60 |
| 4 | 49 | 53 | 5 | 56 | 61 | 6 | 59 | 61 |
| 4 | 50 | 54 | 5 | 57 | 60 | 6 | 64 | 70 |
| 4 | 51 | 55 | 5 | 58 | 63 | 6 | 65 | 71 |
| 4 | 56 | 60 | 5 | 59 | 62 | 6 | 66 | 68 |
| 4 | 57 | 61 | 5 | 64 | 69 | 6 | 67 | 69 |
| 4 | 58 | 62 | 5 | 65 | 68 | 6 | 72 | 78 |
| 4 | 59 | 63 | 5 | 66 | 71 | 6 | 73 | 79 |
| 4 | 64 | 68 | 5 | 67 | 70 | 6 | 74 | 76 |
| 4 | 65 | 69 | 5 | 72 | 77 | 6 | 75 | 77 |
| 4 | 66 | 70 | 5 | 73 | 76 | 6 | 80 | 86 |
| 4 | 67 | 71 | 5 | 74 | 79 | 6 | 81 | 87 |
| 4 | 72 | 76 | 5 | 75 | 78 | 6 | 82 | 84 |
| 4 | 73 | 77 | 5 | 80 | 85 | 6 | 83 | 85 |
| 4 | 74 | 78 | 5 | 81 | 84 | 6 | 88 | 94 |
| 4 | 75 | 79 | 5 | 82 | 87 | 6 | 89 | 95 |
| 4 | 80 | 84 | 5 | 83 | 86 | 6 | 90 | 92 |
| 4 | 81 | 85 | 5 | 88 | 93 | 6 | 91 | 93 |
| 4 | 82 | 86 | 5 | 89 | 92 | 6 | 96 | 102 |
| 4 | 83 | 87 | 5 | 90 | 95 | 6 | 97 | 103 |
| 4 | 88 | 92 | 5 | 91 | 94 | 6 | 98 | 100 |
| 4 | 89 | 93 | 5 | 96 | 101 | 6 | 99 | 101 |
| 4 | 90 | 94 | 5 | 97 | 100 | 6 | 104 | 110 |
| 4 | 91 | 95 | 5 | 98 | 103 | 6 | 105 | 111 |
| 4 | 96 | 100 | 5 | 99 | 102 | 6 | 106 | 108 |
| 4 | 97 | 101 | 5 | 104 | 109 | 6 | 107 | 109 |
| 4 | 98 | 102 | 5 | 105 | 108 | 6 | 112 | 118 |
| 4 | 99 | 103 | 5 | 106 | 111 | 6 | 113 | 119 |
| 4 | 104 | 108 | 5 | 107 | 110 | 6 | 114 | 116 |
| 4 | 105 | 109 | 5 | 112 | 117 | 6 | 115 | 117 |
| 4 | 106 | 110 | 5 | 113 | 116 | 6 | 120 | 126 |
| 4 | 107 | 111 | 5 | 114 | 119 | 6 | 121 | 127 |
| 4 | 112 | 116 | 5 | 115 | 118 | 6 | 122 | 124 |
| 4 | 113 | 117 | 5 | 120 | 125 | 6 | 123 | 125 |
| 4 | 114 | 118 | 5 | 121 | 124 | 7 | 8 | 15 |
| 4 | 115 | 119 | 5 | 122 | 127 | 7 | 9 | 14 |
| 4 | 120 | 124 | 5 | 123 | 126 | 7 | 10 | 13 |
| 4 | 121 | 125 | 6 | 8 | 14 | 7 | 11 | 12 |
| 4 | 122 | 126 | 6 | 9 | 15 | 7 | 16 | 23 |
| 4 | 123 | 127 | 6 | 10 | 12 | 7 | 17 | 22 |
| 5 | 8 | 13 | 6 | 11 | 13 | 7 | 18 | 21 |
| 5 | 9 | 12 | 6 | 16 | 22 | 7 | 19 | 20 |
| 5 | 10 | 15 | 6 | 17 | 23 | 7 | 24 | 31 |
| 5 | 11 | 14 | 6 | 18 | 20 | 7 | 25 | 30 |
| 5 | 16 | 21 | 6 | 19 | 21 | 7 | 26 | 29 |
| 7 | 27 | 28 | 8 | 38 | 46 | 9 | 53 | 60 |
| 7 | 32 | 39 | 8 | 39 | 47 | 9 | 54 | 63 |
| 7 | 33 | 38 | 8 | 48 | 56 | 9 | 64 | 73 |
| 7 | 34 | 37 | 8 | 49 | 57 | 9 | 55 | 62 |
| 7 | 35 | 36 | 8 | 50 | 58 | 9 | 64 | 73 |
| 7 | 40 | 47 | 8 | 51 | 59 | 9 | 65 | 72 |
| 7 | 41 | 46 | 8 | 52 | 60 | 9 | 67 | 74 |
| 7 | 42 | 45 | 8 | 53 | 61 | 9 | 68 | 77 |
| 7 | 43 | 44 | 8 | 54 | 62 | 9 | 69 | 76 |
| 7 | 48 | 55 | 8 | 55 | 63 | 9 | 70 | 79 |
| 7 | 49 | 54 | 8 | 64 | 72 | 9 | 71 | 78 |
| 7 | 50 | 53 | 8 | 65 | 73 | 9 | 80 | 89 |
| 7 | 51 | 52 | 8 | 66 | 74 | 9 | 81 | 88 |
| 7 | 56 | 63 | 8 | 67 | 75 | 9 | 82 | 91 |
| 7 | 57 | 62 | 8 | 68 | 76 | 9 | 83 | 90 |
| 7 | 58 | 61 | 8 | 69 | 77 | 9 | 84 | 93 |
| 7 | 59 | 60 | 8 | 70 | 78 | 9 | 85 | 92 |
| 7 | 64 | 71 | 8 | 71 | 79 | 9 | 86 | 95 |
| 7 | 65 | 70 | 8 | 80 | 88 | 9 | 87 | 94 |
| 7 | 66 | 69 | 8 | 81 | 89 | 9 | 96 | 105 |
| 7 | 67 | 68 | 8 | 82 | 90 | 9 | 97 | 104 |
| 7 | 72 | 79 | 8 | 83 | 91 | 9 | 98 | 107 |
| 7 | 73 | 78 | 8 | 84 | 92 | 9 | 99 | 106 |
| 7 | 74 | 77 | 8 | 85 | 93 | 9 | 100 | 109 |
| 7 | 75 | 76 | 8 | 86 | 94 | 9 | 101 | 108 |
| 7 | 80 | 87 | 8 | 87 | 95 | 9 | 102 | 111 |
| 7 | 81 | 86 | 8 | 96 | 104 | 9 | 103 | 110 |
| 7 | 82 | 85 | 8 | 97 | 105 | 9 | 112 | 121 |
| 7 | 83 | 84 | 8 | 98 | 106 | 9 | 113 | 120 |
| 7 | 88 | 95 | 8 | 99 | 107 | 9 | 114 | 123 |
| 7 | 89 | 94 | 8 | 100 | 108 | 9 | 115 | 122 |
| 7 | 90 | 93 | 8 | 101 | 109 | 9 | 116 | 125 |
| 7 | 91 | 92 | 8 | 102 | 110 | 9 | 117 | 124 |
| 7 | 96 | 103 | 8 | 103 | 111 | 9 | 118 | 127 |
| 7 | 97 | 102 | 8 | 112 | 120 | 9 | 119 | 126 |
| 7 | 98 | 101 | 8 | 113 | 121 | 10 | 16 | 26 |
| 7 | 99 | 100 | 8 | 114 | 122 | 10 | 17 | 27 |
| 7 | 104 | 111 | 8 | 115 | 123 | 10 | 18 | 24 |
| 7 | 105 | 110 | 8 | 116 | 124 | 10 | 19 | 25 |
| 7 | 106 | 109 | 8 | 117 | 125 | 10 | 20 | 30 |
| 7 | 107 | 108 | 8 | 118 | 126 | 10 | 21 | 31 |
| 7 | 112 | 119 | 8 | 119 | 127 | 10 | 22 | 28 |
| 7 | 113 | 118 | 9 | 16 | 25 | 10 | 23 | 29 |
| 7 | 114 | 117 | 9 | 17 | 24 | 10 | 32 | 42 |
| 7 | 115 | 116 | 9 | 18 | 27 | 10 | 33 | 43 |
| 7 | 120 | 127 | 9 | 19 | 26 | 10 | 34 | 40 |
| 7 | 121 | 126 | 9 | 20 | 29 | 10 | 35 | 41 |
| 7 | 122 | 125 | 9 | 21 | 28 | 10 | 36 | 46 |
| 7 | 123 | 124 | 9 | 22 | 31 | 10 | 37 | 47 |
| 8 | 16 | 24 | 9 | 23 | 30 | 10 | 38 | 44 |
| 8 | 17 | 25 | 9 | 32 | 41 | 10 | 39 | 45 |
| 8 | 18 | 26 | 9 | 33 | 40 | 10 | 48 | 58 |
| 8 | 19 | 27 | 9 | 34 | 43 | 10 | 49 | 59 |
| 8 | 20 | 28 | 9 | 35 | 42 | 10 | 50 | 56 |
| 8 | 21 | 29 | 9 | 36 | 45 | 10 | 51 | 57 |
| 8 | 22 | 30 | 9 | 37 | 44 | 10 | 52 | 62 |
| 8 | 23 | 31 | 9 | 38 | 47 | 10 | 53 | 63 |
| 8 | 32 | 40 | 9 | 39 | 46 | 10 | 54 | 60 |
| 8 | 33 | 41 | 9 | 48 | 57 | 10 | 55 | 61 |
| 8 | 34 | 42 | 9 | 49 | 56 | 10 | 64 | 74 |
| 8 | 35 | 43 | 9 | 50 | 59 | 10 | 65 | 75 |
| 8 | 36 | 44 | 9 | 51 | 58 | 10 | 66 | 72 |
| 8 | 37 | 45 | 9 | 52 | 61 | 10 | 67 | 73 |
| 10 | 68 | 78 | 11 | 83 | 88 | 12 | 98 | 110 |
| 10 | 69 | 79 | 11 | 84 | 95 | 12 | 99 | 111 |
| 10 | 70 | 76 | 11 | 85 | 94 | 12 | 100 | 104 |
| 10 | 71 | 77 | 11 | 86 | 93 | 12 | 101 | 105 |
| 10 | 80 | 90 | 11 | 87 | 92 | 12 | 102 | 106 |
| 10 | 81 | 91 | 11 | 96 | 107 | 12 | 103 | 107 |
| 10 | 82 | 88 | 11 | 97 | 106 | 12 | 112 | 124 |
| 10 | 83 | 89 | 11 | 98 | 105 | 12 | 113 | 125 |
| 10 | 84 | 94 | 11 | 99 | 104 | 12 | 114 | 126 |
| 10 | 85 | 95 | 11 | 100 | 111 | 12 | 115 | 127 |
| 10 | 86 | 92 | 11 | 101 | 110 | 12 | 116 | 120 |
| 10 | 87 | 93 | 11 | 102 | 109 | 12 | 117 | 121 |
| 10 | 96 | 106 | 11 | 103 | 108 | 12 | 118 | 122 |
| 10 | 97 | 107 | 11 | 112 | 123 | 12 | 119 | 123 |
| 10 | 98 | 104 | 11 | 113 | 122 | 13 | 16 | 29 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 99 | 105 | 11 | 114 | 121 | 13 | 17 | 28 | 14 | 38 | 40 | 15 | 53 | 58 | 16 | 76 | 92 |
| 10 | 100 | 110 | 11 | 115 | 120 | 13 | 18 | 31 | 14 | 39 | 41 | 15 | 54 | 57 | 16 | 77 | 93 |
| 10 | 101 | 111 | 11 | 116 | 127 | 13 | 19 | 30 | 14 | 48 | 62 | 15 | 55 | 56 | 16 | 78 | 94 |
| 10 | 102 | 108 | 11 | 117 | 126 | 13 | 20 | 25 | 14 | 49 | 63 | 15 | 64 | 79 | 16 | 79 | 95 |
| 10 | 103 | 109 | 11 | 118 | 125 | 13 | 21 | 24 | 14 | 50 | 60 | 15 | 65 | 78 | 16 | 96 | 112 |
| 10 | 112 | 122 | 11 | 119 | 124 | 13 | 22 | 27 | 14 | 51 | 61 | 15 | 66 | 77 | 16 | 97 | 113 |
| 10 | 113 | 123 | 12 | 16 | 28 | 13 | 23 | 26 | 14 | 52 | 58 | 15 | 67 | 76 | 16 | 98 | 114 |
| 10 | 114 | 120 | 12 | 17 | 29 | 13 | 32 | 45 | 14 | 53 | 59 | 15 | 68 | 75 | 16 | 99 | 115 |
| 10 | 115 | 121 | 12 | 18 | 30 | 13 | 33 | 44 | 14 | 54 | 56 | 15 | 69 | 74 | 16 | 100 | 116 |
| 10 | 116 | 126 | 12 | 19 | 31 | 13 | 34 | 47 | 14 | 55 | 57 | 15 | 70 | 73 | 16 | 101 | 117 |
| 10 | 117 | 127 | 12 | 20 | 24 | 13 | 35 | 46 | 14 | 64 | 78 | 15 | 71 | 72 | 16 | 102 | 118 |
| 10 | 118 | 124 | 12 | 21 | 25 | 13 | 36 | 41 | 14 | 65 | 79 | 15 | 80 | 95 | 16 | 103 | 119 |
| 10 | 119 | 125 | 12 | 22 | 26 | 13 | 37 | 40 | 14 | 66 | 76 | 15 | 81 | 94 | 16 | 104 | 120 |
| 11 | 16 | 27 | 12 | 23 | 27 | 13 | 38 | 43 | 14 | 67 | 77 | 15 | 82 | 93 | 16 | 105 | 121 |
| 11 | 17 | 26 | 12 | 32 | 44 | 13 | 39 | 42 | 14 | 68 | 74 | 15 | 83 | 92 | 16 | 106 | 122 |
| 11 | 18 | 25 | 12 | 33 | 45 | 13 | 48 | 61 | 14 | 69 | 75 | 15 | 84 | 91 | 16 | 107 | 123 |
| 11 | 19 | 24 | 12 | 34 | 46 | 13 | 49 | 60 | 14 | 70 | 72 | 15 | 85 | 90 | 16 | 108 | 124 |
| 11 | 20 | 31 | 12 | 35 | 47 | 13 | 50 | 63 | 14 | 71 | 73 | 15 | 86 | 89 | 16 | 109 | 125 |
| 11 | 21 | 30 | 12 | 36 | 40 | 13 | 51 | 62 | 14 | 80 | 94 | 15 | 87 | 88 | 16 | 110 | 126 |
| 11 | 22 | 29 | 12 | 37 | 41 | 13 | 52 | 57 | 14 | 81 | 95 | 15 | 96 | 111 | 16 | 111 | 127 |
| 11 | 23 | 28 | 12 | 38 | 42 | 13 | 53 | 56 | 14 | 82 | 92 | 15 | 97 | 110 | 17 | 32 | 49 |
| 11 | 32 | 43 | 12 | 39 | 43 | 13 | 54 | 59 | 14 | 83 | 93 | 15 | 98 | 109 | 17 | 33 | 48 |
| 11 | 33 | 42 | 12 | 48 | 60 | 13 | 55 | 58 | 14 | 84 | 90 | 15 | 99 | 108 | 17 | 34 | 51 |
| 11 | 34 | 41 | 12 | 49 | 61 | 13 | 64 | 77 | 14 | 85 | 91 | 15 | 100 | 107 | 17 | 35 | 50 |
| 11 | 35 | 40 | 12 | 50 | 62 | 13 | 65 | 76 | 14 | 86 | 88 | 15 | 101 | 106 | 17 | 36 | 53 |
| 11 | 36 | 47 | 12 | 51 | 63 | 13 | 66 | 79 | 14 | 87 | 89 | 15 | 102 | 105 | 17 | 37 | 52 |
| 11 | 37 | 46 | 12 | 52 | 56 | 13 | 67 | 78 | 14 | 96 | 110 | 15 | 103 | 104 | 17 | 38 | 55 |
| 11 | 38 | 45 | 12 | 53 | 57 | 13 | 68 | 73 | 14 | 97 | 111 | 15 | 112 | 127 | 17 | 39 | 54 |
| 11 | 39 | 44 | 12 | 54 | 58 | 13 | 69 | 72 | 14 | 98 | 108 | 15 | 113 | 126 | 17 | 40 | 57 |
| 11 | 48 | 59 | 12 | 55 | 59 | 13 | 70 | 75 | 14 | 99 | 109 | 15 | 114 | 125 | 17 | 41 | 56 |
| 11 | 49 | 58 | 12 | 64 | 76 | 13 | 71 | 74 | 14 | 100 | 106 | 15 | 115 | 124 | 17 | 42 | 59 |
| 11 | 50 | 57 | 12 | 65 | 77 | 13 | 80 | 93 | 14 | 101 | 107 | 15 | 116 | 123 | 17 | 43 | 58 |
| 11 | 51 | 56 | 12 | 66 | 78 | 13 | 81 | 92 | 14 | 102 | 104 | 15 | 117 | 122 | 17 | 44 | 61 |
| 11 | 52 | 63 | 12 | 67 | 79 | 13 | 82 | 95 | 14 | 103 | 105 | 15 | 118 | 121 | 17 | 45 | 60 |
| 11 | 53 | 62 | 12 | 68 | 72 | 13 | 83 | 94 | 14 | 112 | 126 | 15 | 119 | 120 | 17 | 46 | 63 |
| 11 | 54 | 61 | 12 | 69 | 73 | 13 | 84 | 89 | 14 | 113 | 127 | 16 | 32 | 48 | 17 | 47 | 62 |
| 11 | 55 | 60 | 12 | 70 | 74 | 13 | 85 | 88 | 14 | 114 | 124 | 16 | 33 | 49 | 17 | 64 | 81 |
| 11 | 64 | 75 | 12 | 71 | 75 | 13 | 86 | 91 | 14 | 115 | 125 | 16 | 34 | 50 | 17 | 65 | 80 |
| 11 | 65 | 74 | 12 | 80 | 92 | 13 | 87 | 90 | 14 | 116 | 122 | 16 | 35 | 51 | 17 | 66 | 83 |
| 11 | 66 | 73 | 12 | 81 | 93 | 13 | 96 | 109 | 14 | 117 | 123 | 16 | 36 | 52 | 17 | 67 | 82 |
| 11 | 67 | 72 | 12 | 82 | 94 | 13 | 97 | 108 | 14 | 118 | 120 | 16 | 37 | 53 | 17 | 68 | 85 |
| 11 | 68 | 79 | 12 | 83 | 95 | 13 | 98 | 111 | 14 | 119 | 121 | 16 | 38 | 54 | 17 | 69 | 84 |
| 11 | 69 | 78 | 12 | 84 | 88 | 13 | 99 | 110 | | | | | | | | | |
| 11 | 70 | 77 | 12 | 85 | 89 | 13 | 100 | 105 | 17 | 70 | 87 | 18 | 101 | 119 | 20 | 36 | 48 |
| 11 | 71 | 76 | 12 | 86 | 90 | 13 | 101 | 104 | 17 | 71 | 86 | 18 | 102 | 116 | 20 | 37 | 49 |
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| 13 | 113 | 124 | 15 | 16 | 31 | 16 | 39 | 55 | 17 | 76 | 93 | 18 | 107 | 121 | 20 | 42 | 62 |
| 13 | 114 | 127 | 15 | 17 | 30 | 16 | 40 | 56 | 17 | 77 | 92 | 18 | 108 | 126 | 20 | 43 | 63 |
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| 13 | 116 | 121 | 15 | 19 | 28 | 16 | 42 | 58 | 17 | 79 | 94 | 18 | 110 | 124 | 20 | 45 | 58 |
| 13 | 117 | 120 | 15 | 20 | 27 | 16 | 43 | 59 | 17 | 96 | 113 | 18 | 111 | 125 | 20 | 46 | 58 |
| 13 | 118 | 123 | 15 | 21 | 26 | 16 | 44 | 60 | 17 | 97 | 112 | 19 | 32 | 51 | 20 | 47 | 59 |
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| 14 | 20 | 26 | 15 | 35 | 44 | 16 | 66 | 82 | 17 | 103 | 118 | 19 | 38 | 53 | 20 | 69 | 81 |
| 14 | 21 | 27 | 15 | 36 | 43 | 16 | 67 | 83 | 17 | 104 | 121 | 19 | 39 | 52 | 20 | 70 | 82 |
| 14 | 22 | 24 | 15 | 37 | 42 | 16 | 68 | 84 | 17 | 105 | 120 | 19 | 40 | 59 | 20 | 71 | 83 |
| 14 | 23 | 25 | 15 | 38 | 41 | 16 | 69 | 85 | 17 | 106 | 123 | 19 | 41 | 58 | 20 | 72 | 92 |
| 14 | 32 | 46 | 15 | 39 | 40 | 16 | 70 | 86 | 17 | 107 | 122 | 19 | 42 | 57 | 20 | 73 | 93 |
| 14 | 33 | 47 | 15 | 48 | 63 | 16 | 71 | 87 | 17 | 108 | 125 | 19 | 43 | 56 | 20 | 74 | 94 |
| 14 | 34 | 44 | 15 | 49 | 62 | 16 | 72 | 88 | 17 | 109 | 124 | 19 | 44 | 63 | 20 | 75 | 95 |
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| 14 | 36 | 42 | 15 | 51 | 60 | 16 | 74 | 90 | 17 | 111 | 126 | 19 | 46 | 61 | 20 | 77 | 89 |
| 14 | 37 | 43 | 15 | 52 | 59 | 16 | 75 | 91 | 18 | 32 | 50 | 19 | 47 | 60 | 20 | 78 | 90 |

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| 18 | 69 | 87 | 19 | 100 | 119 | 21 | 35 | 54 | 22 | 72 | 94 | 23 | 103 | 112 | 25 | 38 | 63 |
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| 21 | 68 | 81 | 22 | 99 | 117 | 24 | 34 | 58 | 25 | 71 | 94 | 26 | 102 | 124 | 28 | 37 | 57 |
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| 29 | 45 | 48 | 30 | 76 | 82 | 31 | 107 | 116 | 34 | 64 | 98 | 35 | 95 | 124 | 37 | 94 | 123 |
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## References

[1] Center for Communications Research, available at http://www.ccrwest.org/
[2] Erdoğan, N.K.,(2017) ,"Greedy AlgoritmasıileDengeliTamamlanmışDeneyTasarımBloklarınınOluşturulmasıve (63,651,31,3,1) Tasarımı", *DumlupınarÜniversitesiSosyalBilimlerDergisi*, Sayı52, pp.149-159.
[3] JenH-L., Hsia T-C., and Hasan, M.B., (2007), "A Study of Methods for Construction of Balanced Incomplete Block Design, *Journal of Discrete Mathematical Sciences and Cryptography*, Volume 10, No. 2, pp. 227–243.
[4] Herath, H. M. I. C.,Perera, A. A. I. and Jayathilake, A. A. C. A.,(2015), "Generation of Steiner Quadruple Systems", *International Journal of Science and Research ( IJSR)*, Volume 4, Issue 12, pp.1551-1558.
[5] Oliveria, T., and Valcheva P. (2018),"Some Combinatorial Stuctures in Experimental Design: Overview, Statistical Models and Applications", *Biometrics &Biostatistics International Journal*, MedCrave, Volume 7, Issue 4, pp.346-351.
[6] Özkan Ş, Küçükçifçis.(2004), tasarımlar, Matematikdünyası Kış, 28-34
[7] Rosa A., Combinatorıal Design Theory – Notes, [Online]. available at http://kam.mff.cuni.cz/~atcagc14/materialy/DesignTheoryNotes.pdf
[8] Rueda D.R., Leiva A.J.F, and Cotta C.(2011), "A Memetic Algorithm For Designing Balanced Incomplete Blocks", *International Journal Of Combinatorial Optimization Problems And Informatics*, Volume 2, No:1, pp.14-22.

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