

# Package ‘CombinS’

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**Type** Package

**Title** Construction Methods of some Series of PBIB Designs

**Version** 1.1-1

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**Description** Series of partially balanced incomplete block designs (PBIB) based on the combinatorial method (S) introduced in (Imane Rezgui et al, 2014) <[doi:10.3844/jmssp.2014.45.48](https://doi.org/10.3844/jmssp.2014.45.48)>; and it gives their associated U-type design.

**Imports** stats, utils

**URL** 'www.sites.google.com/site/mohamedlaibwebpage'

**License** GPL-3

**Encoding** UTF-8

**LazyData** true

**Note** This version is a generalisation for  $(v=wnl)$  treatments. In the version 1.0 we used rectangular right angular  $(m)$  association schemes with  $(v=2nl)$  and  $m=4,5$  and  $7$  associated classes. The Association schemes used in this R-package are : Rectangular association scheme; Generalized rectangular right angular association scheme (4); Generalized rectangular right angular association scheme (5); Generalized rectangular right angular association scheme (7).

**RoxygenNote** 5.0.1

**NeedsCompilation** no

**Repository** CRAN

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CombS	<i>The Combinatory Method (s) for the construction of rectangular PBIB designs</i>
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### Description

The application of the Combinatory Method (s), with  $s$  chosen in  $[2, l-1]$ , on rectangular association scheme to obtain the configuration and the parameters of the PBIB design associated.

### Usage

CombS(n, l, s)

### Arguments

n	Number of lines of the association schemes array.
l	Number of columns of the association schemes array.
s	Number of the token treatments from the same row of the association scheme.

### Details

- For  $2 < s < l$ , we obtain a rectangular PBIB design.
- For  $s = l$ , we obtain a singular group divisible designs.

### Value

A LIST :

- PBIB The configuration of the PBIB.
- Type The type of the design
- V Number of treatments.
- B Number of blocs.
- R Repetition of each treatment.
- K Size of blocs.
- lamda Vector of m-lambda.
- Resolvable Is the design Resolvable ?

**Author(s)**

Mohamed Laib, Imane Rezgui, Zebida Gheribi-Aoulmi and Herve Monod

**References**

Imane Rezgui, Z. Gheribi-Aoulmi (2014). New construction method of rectangular partially balanced incomplete block designs and singular group divisible designs, *Journal of Mathematics and Statistics*, 10, 45- 48.

M.N. Vartak 1955. On an application of Kronecker product of Matrices to Statistical designs. *Ann. Math. Stat.*,26(420-438).

**See Also**

[UType](#)

**Examples**

```
## Not run:
n<-3
l<-3
s<-2
CombS(1, n, s)

## End(Not run)
```

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GPBIB4A

*Generalized rectangular right angular (4) design with  $\lambda_4 = 0$*

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**Description**

Gives the configuration and the parametres of the design obtained by the first construction method of GPBIB\_4 (see 3.1.1 of the paper rezgui et al (2015)).

**Usage**

GPBIB4A(n, l, s, w)

**Arguments**

n	Number of lines of the association schemes array.
l	Number of columns of the association schemes array.
s	Number of the token treatments from the same row of the association scheme.
w	Number of the association scheme arrays.

**Details**

- For  $s = l$ , the previous method gives configuration of nested group divisible designs.

**Value**

A LIST :

- PBIB The configuration of the PBIB.
- Type The type of the design
- V Number of treatments.
- B Number of blocs.
- R Repetition of each treatment.
- K Size of blocs.
- lamda Vector of m-lambda.
- Resolvable Is the design Resolvable ?

**Note**

For  $w = 2$ , the GPBIB\_4 is a rectangular right angular (4) (PBIB\_4)

**Author(s)**

Mohamed Laib, Imane Rezgui, Zebida Gheribi-Aoulmi and Herve Monod

**References**

Imane Rezgui, Z. Gheribi-Aoulmi and H. Monod (2015). U-type Designs via New Generalized Partially Balanced Incomplete Block Designs with  $m = 4, 5$  and  $7$  Associated Classes, *Applied mathematics*, 6, 242-264.

Imane Rezgui, Z.Gheribi-Aoulmi and H. Monod, New association schemes with 4, 5 and 7 associated classes and their associated partially balanced incomplete block designs; *Advances and Applications in Discrete Mathematics Vol.12 Issue 2* 197-206.

**See Also**

[GPBIB4B](#) and [UType](#)

**Examples**

```
## Not run:
n<-3
l<-3
s<-3
w<-3
GPBIB4A(n, l, s, w)

## End(Not run)
```

---

GPBIB4B	<i>Generalized rectangular right angular (4) design with <math>\lambda_4</math> not equal to 0</i>
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### Description

Gives the configuration and the parametres of the design obtained by the seconde construction method of GPBIB\_4 (see 3.1.2 of the paper rezgui et al (2015)).

### Usage

GPBIB4B(n, l, s, w)

### Arguments

n	Number of lines of the association schemes array.
l	Number of columns of the association schemes array.
s	Number of the token treatments from the same row of the association scheme.
w	Number of the association scheme arrays.

### Value

A LIST :

- PBIB The configuration of the PBIB.
- Type The type of the design
- V Number of treatments.
- B Number of blocs.
- R Repetition of each treatment.
- K Size of blocs.
- lamda Vector of m-lambda.
- Resolvable Is the design Resolvable ?

### Note

For  $w = 2$ , the GPBIB\_4 is a rectangular right angular (4) (PBIB\_4)

### Author(s)

Mohamed Laib, Imane Rezgui, Zebida Gheribi-Aoulmi and Herve Monod

## References

Imane Rezgui, Z. Gheribi-Aoulmi and H. Monod (2015). U-type Designs via New Generalized Partially Balanced Incomplete Block Designs with  $m = 4, 5$  and  $7$  Associated Classes, *Applied mathematics*, **6**, 242-264.

Imane Rezgui, Z.Gheribi-Aoulmi and H. Monod, New association schemes with  $4, 5$  and  $7$  associated classes and their associated partially balanced incomplete block designs; *Advances and Applications in Discrete Mathematics* Vol.12 Issue 2 197-206.

## See Also

[GPBIB4A](#) and [UType](#)

## Examples

```
## Not run:
n<-3
l<-3
s<-3
w<-3
GPBIB4B(n, l, s, w)

## End(Not run)
```

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GPBIB5

*Generalized rectangular right angular (5) design.*

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## Description

gives the configuration and the parametres of the design obtained by the construction method of GPBIB\_5 (see 3.2 of the paper rezgui et al (2015)).

## Usage

```
GPBIB5(n, l, s, w)
```

## Arguments

n	Number of lines of the association schemes array.
l	Number of columns of the association schemes array.
s	Number of the token treatments from the same row of the association scheme.
w	Number of the association scheme arrays.

**Value**

A LIST :

- PBIB The configuration of the PBIB.
- Type The type of the design
- V Number of treatments.
- B Number of blocs.
- R Repetition of each treatment.
- K Size of blocs.
- lamda Vector of m-lambda.
- Resolvable Is the design Resolvable ?

**Note**

For  $w = 2$ , the GPBIB\_5 is a rectangular right angular (5) (PBIB\_5).

**Author(s)**

Mohamed Laib, Imane Rezgui, Zebida Gheribi-Aoulmi and Herve Monod

**References**

Imane Rezgui, Z. Gheribi-Aoulmi and H. Monod (2015). U-type Designs via New Generalized Partially Balanced Incomplete Block Designs with  $m = 4, 5$  and  $7$  Associated Classes, *Applied mathematics*, 6, 242-264.

Imane Rezgui, Z.Gheribi-Aoulmi and H. Monod, New association schemes with 4, 5 and 7 associated classes and their associated partially balanced incomplete block designs; *Advances and Applications in Discrete Mathematics Vol.12 Issue 2* 197-206.

**See Also**

[UType](#)

**Examples**

```
## Not run:
n<-3
l<-3
s<-3
w<-3
GPBIB5(n, l, s, w)

## End(Not run)
```

---

GPBIB7A	<i>Generalized rectangular right angular (7) design with <math>\lambda_i</math> equal to <math>\lambda_i + 4</math> (<math>i = 1, \dots, 4</math>)</i>
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### Description

gives the configuration and the parametres of the design obtained by the first construction method of GPBIB\_7 (see 3.3.1 of the paper rezgui et al (2015))

### Usage

GPBIB7A(n, l, s, w)

### Arguments

n	Number of lines of the association schemes array.
l	Number of columns of the association schemes array.
s	Number of the token treatments from the same row of the association scheme.
w	Number of the association scheme arrays.

### Value

A LIST :

- PBIB The configuration of the PBIB.
- Type The type of the design
- V Number of treatments.
- B Number of blocs.
- R Repetition of each treatment.
- K Size of blocs.
- lambda Vector of m-lambda.
- Resolvable Is the design Resolvable ?

### Note

For  $w = 2$ , the GPBIB\_7 is a rectangular right angular (7) (PBIB\_7).

### Author(s)

Mohamed Laib, Imane Rezgui, Zebida Gheribi-Aoulmi and Herve Monod



## References

Imane Rezgui, Z. Gheribi-Aoulmi and H. Monod (2015). U-type Designs via New Generalized Partially Balanced Incomplete Block Designs with  $m = 4, 5$  and  $7$  Associated Classes, *Applied mathematics*, **6**, 242-264.

Imane Rezgui, Z.Gheribi-Aoulmi and H. Monod, New association schemes with  $4, 5$  and  $7$  associated classes and their associated partially balanced incomplete block designs; *Advances and Applications in Discrete Mathematics* Vol.12 Issue 2 197-206.

## See Also

[GPBIB7B](#) and [UType](#)

## Examples

```
## Not run:
n<-3
l<-3
s<-3
w<-3
GPBIB7A(n, l, s, w)

## End(Not run)
```

---

GPBIB7B	<i>Generalized rectangular right angular (7) design with distinct <math>\lambda_i</math> (<math>i=1,\dots,7</math>)</i>
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## Description

Gives the configuration and the parametres of the design obtained by the seconde construction method of GPBIB\_7 (see 3.3.2 of the paper rezgui et al (2015)).

## Usage

```
GPBIB7B(n, l, s, w)
```

## Arguments

n	Number of lines of the association schemes array.
l	Number of columns of the association schemes array.
s	Number of the token treatments from the same row of the association scheme.
w	Number of the association scheme arrays.

**Value**

A LIST :

- PBIB The configuration of the PBIB.
- Type The type of the design
- V Number of treatments.
- B Number of blocs.
- R Repetition of each treatment.
- K Size of blocs.
- lambda Vector of m-lambda.
- Resolvable Is the design Resolvable ?

**Note**

For  $w = 2$ , the GPBIB\_7 is a rectangular right angular (7) (PBIB\_7).

**Author(s)**

Mohamed Laib, Imane Rezgui, Zebida Gheribi-Aoulmi and Herve Monod

**References**

Imane Rezgui, Z. Gheribi-Aoulmi and H. Monod (2015). U-type Designs via New Generalized Partially Balanced Incomplete Block Designs with  $m = 4, 5$  and  $7$  Associated Classes, *Applied mathematics*, 6, 242-264.

Imane Rezgui, Z.Gheribi-Aoulmi and H. Monod, New association schemes with 4, 5 and 7 associated classes and their associated partially balanced incomplete block designs; *Advances and Applications in Discrete Mathematics Vol.12 Issue 2* 197-206.

**See Also**

[GPBIB7A](#) and [UType](#)

**Examples**

```
## Not run:
n<-3
l<-3
s<-3
w<-3
GPBIB7B(n, l, s, w)

## End(Not run)
```

---

UType

*U-type design via some PBIB designs*

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**Description**

Applies the Fang algorithm on our constructed designs to obtain the configuration and the parameters of the U-type design associated.

**Usage**

UType(lst)

**Arguments**

lst                    The output of one of our package functions.

**Value**

A LIST :

- v Number of runs.
- r Number of factors.
- UtypeDesign The configuration of the U-type design..

**Author(s)**

Mohamed Laib, Imane Rezgui, Zebida Gheribi-Aoulmi and Herve Monod

**References**

K.T. Fang, R.Li and A.Sudjanto (2006). Design and Modeling for Computer Experiments. Taylor & Francis Group, LLC London.

**Examples**

```
## Not run:  
M<-GPBIB4A(4,4,2,2)  
UType(M)  
  
## End(Not run)
```

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