SAS Macro for Generation of Linear Trend Free Constant Block Sum Resolvable PBIB (TF-CBSRPBIB) Designs Based on Circular Lattice Association Scheme

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Following SAS macro has been developed to generate a class of **Resolvable TFCBS-PBIB designs in based on circular lattice association scheme as obtained by Verma (2021)**. Here user needs to enter the number of arch as '***s* = ' where number of treatments=$2s^2$**. Once the value is entered, the programme will generate a TFCBS-PBIB design based on method of Verma (2021). Along with the design, a polynomial coefficient (linear) which will be used to measure the effect of trend component would also be generated. The parameters of the design will also be highlighted. Here, the name of the association scheme based on which the design is developed will also be printed once the programme is executed. After execution of the macro, a word file containing the output would also be generated this can then be saved by the user.

```
/*SAS Macro for Generation of Linear Trend Free Constant Block
Sum Resolvable PBIB (TF-CBSRPBIB) Designs Based on Circular
Lattice Association Scheme*/
%let s=3; /*Enter the value of s,where v (number of
treatments)=2s^2 */
ods rtf  file= 'output.rtf' startpage=no;
proc iml;
a01=1:&s*&s;
a=shape(a01,&s,&s);
a02=(&s*&s)+1:2*&s*&s;
aa=shape(a02,&s,&s);
*print a aa;
a1=j(&s,&s,0);
do i=1 to &s;
do j=1 to &s;
if j+(i-1)<=&s then do;
a1[i,j+(i-1)]=a[i,j];
end;
end;
end;
do i=2 to &s;
k=1;
do j=&s-(i-2) to &s;
a1[i,k]=a[i,j];
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```
k=k+1;
end;
end;
*print a1;
start Rot270(a);
   return( T(a[nrow(a):1,]) );          /* up-down flip, then
transpose */
finish;
a_rot= rot270(a);
*print a_rot;
a2=j(&s,&s,0);
do i=1 to &s;
do j=1 to &s-(i-1);
a2[i,j]=a_rot[i,j+(i-1)];
end;
end;
do i=2 to &s;
do j=1 to (i-1);
a2[i,&s-(i-1)+j]=a_rot[i,j];
end;
end;
*print a2;
start Rot270(aa);
   return( T(aa[nrow(aa):1,]) );          /* up-down flip, then
transpose */
finish;
aa= rot270(aa);
*print aa;
start Rot270(aa);
   return( T(aa[nrow(aa):1,]) );          /* up-down flip, then
transpose */
finish;
aa= rot270(aa);
*print aa;
aa1=j(&s,&s,0);
do i=1 to &s;
do j=1 to &s;
if j+(i-1)<=&s then do;
aa1[i,j+(i-1)]=aa[i,j];
end;
end;
end;
do i=2 to &s;
k=1;
do j=&s-(i-2) to &s;
aa1[i,k]=aa[i,j];
k=k+1;
```

```
end;
end;
*print aa1;
start Rot270(aa);
   return( T(aa[nrow(aa):1,]) );          /* up-down flip, then
transpose */
finish;
aa_rot= rot270(aa);
*print aa_rot0;
aa2=j(&s,&s,0);
do i=1 to &s;
do j=1 to &s-(i-1);
aa2[i,j]=aa_rot[i,j+(i-1)];
end;
end;
do i=2 to &s;
do j=1 to (i-1);
aa2[i,&s-(i-1)+j]=aa_rot[i,j];
end;
end;
*print aa2;
do i= 1 to ncol(a);
D=(a1[ ,i]||aa1[ ,i])//(aa2[ ,i]||a2[ ,i]);
D1=D1||D;
end;
*print D1;
tr_coeff=j(1,ncol(D1),0);
do i=1 to ncol(D1);
if mod(ncol(D1),2)=1 then do;
tr_coeff[1,i]=(-ncol(D1)+2*(i-1)+1)/2;
end;
else do;
tr_coeff[1,i]=(-ncol(D1)+2*(i-1)+1);
end;
end;
*print tr_coeff;
v=2*&s**2;
b=2*&s;
r=2;
k=2*&s;
Lambda1=2;
Lambda2=1;
Lambda3=0;
print 'Three-Associate Linear Trend Free Constant Block Sum
Resolvable PBIB Designs based on Circular Lattice Association
Scheme';
Trend_Free_PBIBD=tr_coeff//D1;
```

```
print Trend_Free_PBIBD;
print 'Top row represents non normalized orthogonal polynomial
coefficient of degree one';
print 'Parameters of the design are' ;
print v b r k Lambda1 Lambda2 Lambda3;
print 'Association Scheme of the Design: Three-Associate Class
Circular Association';
run;
ods rtf close;

quit;
```

SAS Output

Three-Associate Linear Trend Free Constant Block Sum Resolvable PBIB Designs based on Circular Lattice Association Scheme

Trend_Free_PBIBD					
-5	-3	-1	1	3	5
1	18	2	17	3	16
6	13	4	15	5	14
8	11	9	10	7	12
12	7	15	4	18	1
14	5	17	2	11	8
16	3	10	9	13	6

Top row represents non normalized orthogonal polynomial coefficient of degree one

Parameters of the design are

v	b	r	k	Lambda1	Lambda2	Lambda3
18	6	2	6	2	1	0

Association Scheme of the Design: Three-Associate Class Circular Association

Reference

Verma, S. (2021). *Trend resistant constant block-sum Partially balanced incomplete block designs*. Unpublished M.Sc. thesis. ICAR-IARI, New Delhi