

Supplementary materials for
Generators for Nonregular 2^{k-p} Designs
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This file contains the following sections:

1. The design matrix **D** and the generator matrix **G** for Bulutoglu and Kaziska's 2^{12-7} maximal array
2. The generator matrix **G** for the strength-4 2^{15-8}
3. The design matrix **D**, augmented with column N, and the generator matrix **G** for the Paley 2^{31-26}
4. The design matrix **D**, augmented with column N, for Pigeon and McAllister's partially replicated 2^{7-3}
5. Matlab code for symbolic computation of the defining relations for Type 1 designs and the indicator function for Type 2 and Type 3 designs

1. Bulutoglu and Kaziska's 2^{12-7} maximal array, **D** and **G**

Design matrix, **D**

1	2	3	4	5	6	7	8	9	10	11	12
-1	1	-1	1	1	-1	-1	-1	1	-1	-1	-1
1	1	-1	1	-1	1	-1	-1	1	1	1	-1
-1	1	-1	-1	1	-1	-1	1	-1	1	-1	1
1	-1	-1	1	1	-1	1	1	-1	-1	1	-1
1	-1	-1	-1	1	1	-1	1	1	-1	1	1
-1	-1	1	1	-1	-1	1	-1	-1	1	1	1
1	1	-1	1	-1	1	-1	1	-1	1	-1	1
1	1	-1	1	-1	1	1	-1	-1	-1	1	1
-1	-1	1	-1	1	1	-1	-1	-1	1	-1	-1
1	1	1	-1	1	-1	1	-1	-1	1	1	-1
1	1	1	-1	-1	-1	-1	1	1	1	-1	-1
1	1	1	-1	-1	-1	1	-1	1	-1	-1	1
1	-1	1	1	1	-1	-1	-1	1	-1	-1	1
1	-1	1	1	-1	1	-1	1	-1	-1	1	-1
-1	-1	1	1	-1	-1	-1	1	-1	-1	-1	1
-1	-1	1	1	-1	-1	-1	-1	1	1	1	-1
-1	-1	-1	-1	-1	1	1	1	1	-1	-1	-1
-1	1	-1	1	-1	-1	1	-1	-1	-1	-1	-1
1	-1	-1	1	1	-1	1	1	-1	1	-1	1
-1	1	-1	-1	1	-1	-1	1	-1	-1	1	-1
1	1	1	-1	1	1	1	-1	-1	-1	-1	-1
1	-1	-1	-1	1	-1	1	-1	1	1	1	1
-1	1	1	1	1	1	1	1	1	1	-1	1
-1	1	1	1	1	1	1	1	1	-1	1	-1
-1	-1	-1	-1	-1	-1	1	1	1	1	1	-1
-1	-1	1	-1	1	1	-1	-1	-1	-1	1	1
1	1	1	-1	-1	-1	-1	1	1	-1	1	1
-1	1	1	1	1	1	1	1	1	1	1	1
-1	1	-1	-1	-1	1	-1	-1	-1	1	1	1
-1	-1	-1	-1	-1	1	1	-1	1	-1	-1	1
1	-1	1	-1	-1	1	1	1	-1	1	-1	-1
1	-1	-1	1	1	1	1	-1	1	1	-1	-1

Generator matrix, **G**, with basic columns A=1, B=2, C=7, D=11, E=12

Yates#	Interaction	3	4	5	6	8	9	10
3	AB	0.25	-0.25	-0.5	0	-0.25	0	0
5	AC	0	-0.25	0.25	-0.25	-0.25	-0.5	0
6	BC	0.5	0.25	0.25	0.25	-0.25	0	-0.25
7	ABC	-0.25	-0.25	0	0	-0.25	0	-0.25
9	AD	-0.25	0	0	0	0	0	-0.25
10	BD	0	0	0	0.25	0	0	0
11	ABD	0	0.25	0	-0.25	-0.25	0	0.25
12	CD	0	0.25	0.25	-0.25	0	0	0.25
13	ACD	-0.25	0	0	0	-0.25	0	0
14	BCD	0	0	0	0.25	0.25	0	0
15	ABCD	0	0	-0.25	0	0.25	-0.5	0.25
17	AE	-0.25	0	0	-0.25	0	0.25	-0.25
18	BE	0	0	-0.25	0.25	0.25	0	0.25
19	ABE	0	0.25	-0.25	0	0	-0.25	-0.5
20	CE	0	0.25	0	0	-0.25	0.25	0.25
21	ACE	-0.25	0	-0.25	0	0	0	0
22	BCE	0	0	0	0	0.25	0.25	-0.25
23	ABCE	0	0	-0.25	0	-0.25	0	0
24	DE	0	-0.25	0	0.25	-0.25	0	0
25	ADE	0	-0.25	0	0	0.25	0.25	0
26	BDE	0	0.25	-0.25	-0.25	0	0	-0.25
27	ABDE	0.25	0	0.25	0	0.25	-0.25	-0.25
28	CDE	0	0.25	-0.25	0	0	-0.25	0
29	ACDE	0	0	0	0.5	-0.25	0	0
30	BCDE	-0.5	0	0.25	0.25	0	-0.25	0
31	ABCDE	-0.25	0.5	0	0.25	0	0	0

2. Strength-4 2^{15-8} generator matrix **G**

Basic factors A-G

Term	H	J	K	L	M	N	O	P
A*B*C*E*F*G	1	0	0	0	0	0	0	0
A*B*C*D*G	0	0.5	0	0	0	0	0	0
A*D*E*F*G	0	0.5	0	0	0	0	0	0
C*D*E*G	0	0.5	0	0	0	0	0	0
B*D*F*G	0	-0.5	0	0	0	0	0	0
A*D*F*G	0	0	0.5	0	0	0	0	0
B*D*E*F*G	0	0	0.5	0	0	0	0	0
C*D*E*F	0	0	0.5	0	0	0	0	0
A*B*C*D*F	0	0	-0.5	0	0	0	0	0
A*C*D*E*F	0	0	0	0.5	0	0	0	0
B*C*D*E*G	0	0	0	0.5	0	0	0	0
B*C*D*F	0	0	0	0.5	0	0	0	0
A*C*D*G	0	0	0	-0.5	0	0	0	0
A*B*C*D*E	0	0	0	0	0.5	0	0	0
A*D*E*G	0	0	0	0	0.5	0	0	0
B*D*E*F	0	0	0	0	0.5	0	0	0
C*D*E*F*G	0	0	0	0	-0.5	0	0	0
A*B*D*E*F	0	0	0	0	0	0.5	0	0
A*B*D*G	0	0	0	0	0	0.5	0	0
B*C*D*F*G	0	0	0	0	0	0.5	0	0
B*C*D*E	0	0	0	0	0	-0.5	0	0
A*B*D*F	0	0	0	0	0	0	0.5	0
A*C*D*E	0	0	0	0	0	0	0.5	0
A*C*D*F*G	0	0	0	0	0	0	0.5	0
A*B*D*E*G	0	0	0	0	0	0	-0.5	0
A*B*C*D	0	0	0	0	0	0	0	0.5
B*D*E*G	0	0	0	0	0	0	0	0.5
C*D*F*G	0	0	0	0	0	0	0	0.5
A*D*E*F	0	0	0	0	0	0	0	-0.5

3. The design matrix, **D**, and generator matrix, **G**, for the Paley 2^{31-26}

Design matrix, **D**, augmented with first column N

0-1 matrix to save space

N	1	2	3	4	5	6	7	8	9	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	
0	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	
1	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	
0	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	
1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	0	1	1	0	0	1	0	
1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	
0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	
0	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	
1	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	0	1	1	0	0	1	0	0	0	
1	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	1	0	0	0	1	1	1	0	1	0	0	
0	0	0	1	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	1	1	0	
1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	
0	0	0	1	0	0	1	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	1	0	1	1	1	
1	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	0	1	1	1	0	1	0	1	
0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	
0	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	1	0	0	1	1	1	1	0	1	1	0	1	1	1	0	
0	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	0	1	1	1	1	0	1	1	0	
1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	1	0	1	0	0	0	1	
0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	
1	1	1	0	1	0	1	0	0	1	1	1	0	1	1	0	1	1	0	0	1	0	0	1	0	0	1	0	0	0	1	1	0
1	1	0	0	0	1	1	1	0	1	1	0	1	1	1	0	1	1	0	1	0	0	1	0	0	1	0	0	0	1	1	1	0
0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	
0	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	
1	1	1	1	0	1	0	1	0	0	1	1	1	1	0	1	1	0	1	1	0	1	1	0	0	1	0	0	1	0	0	0	
0	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	
1	1	1	1	0	0	0	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	1	0	0	0	1	1	1	0
0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	
0	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	
1	1	1	1	0	0	1	1	0	1	1	1	0	0	1	1	1	0	1	0	1	0	0	1	0	0	1	1	1	1	0	1	0
0	1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	
0	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	1	1	
1	1	1	1	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	1	0	1	0	0	0	1	0

Generator matrix, **G**, with basic factors 1, 3, 6, 8, N

First 9 generators

Term	2	4	5	7	9	10	11	12	13
1*3	0	-0.25	0	0	0.25	0	0.25	-0.25	-0.25
1*3*6	0	0.25	0	0.25	0.25	0	-0.25	-0.25	-0.25
1*3*6*8	0.25	-0.25	0.25	-0.25	-0.25	0	0	0.25	-0.25
1*3*8	0	0.25	-0.25	0	0	0	0	-0.25	0.25
1*6	0.25	0	-0.25	0	0	0.25	0	-0.25	-0.25
1*6*8	-0.25	-0.25	0	0.25	0	0.25	0.25	0	0.25
1*8	-0.25	-0.25	0.25	0.25	-0.25	0	-0.25	-0.25	0
3*6	0.25	0	-0.25	-0.25	0	-0.25	0	-0.25	0.25
3*6*8	0.25	0.25	0.25	0	0.25	-0.25	0	0	0.25
3*8	-0.25	0.25	0	-0.25	0	0	0	0.25	0
6*8	-0.25	0	0	0	-0.25	0	0	0	0
N	0.25	-0.25	0.25	0.25	0.25	0	0.25	0	0.25
N*1	0	0	-0.25	-0.25	0	0.25	-0.25	0	0.25
N*1*3	0.25	-0.5	-0.25	0	0	-0.25	-0.25	0.25	0
N*1*3*6	0	0	0	-0.25	0.25	-0.25	0	0	-0.25
N*1*3*6*8	0.5	0.25	0	0.25	-0.25	0.25	0	0.25	0
N*1*3*8	0	-0.25	-0.25	0	0.25	0.25	-0.25	0	0.25
N*1*6	0	0	0.25	-0.25	-0.25	0	0	0	0.25
N*1*6*8	0.25	0	0.25	0	-0.25	0	0	-0.5	0
N*1*8	0	0	0.25	0	0.25	0.25	-0.25	0	0
N*3	0	0	0.25	0	0	0	-0.5	0	0.25
N*3*6	0	0	0.25	-0.25	0.25	0.25	-0.25	0	-0.25
N*3*6*8	-0.25	0	0	0	0	-0.25	0	0	0
N*3*8	0	0	0	-0.25	0	0.5	0.25	0	0
N*6	0	-0.25	0	-0.25	0	0	0	-0.25	0
N*6*8	0	0	0.25	-0.25	0.25	0	0.25	0	0.25
N*8	0	0	0	0.25	0.25	0	0	0.25	0

Second 9 generators

Term	14	15	16	17	18	19	20	21	22
1*3	0.25	-0.25	0.25	0.25	-0.25	-0.25	0.25	-0.25	0
1*3*6	0.25	0.25	0	-0.25	-0.25	0	0	0	0
1*3*6*8	0	0	-0.25	-0.25	-0.25	0.25	0	0	0
1*3*8	-0.25	0	0.25	0	0	0.25	0	0	0.25
1*6	0	-0.25	0	-0.25	0.25	0	-0.25	0.25	-0.25
1*6*8	0	-0.25	-0.25	0	0.25	0	0	0.25	0
1*8	-0.25	0	0	0	-0.25	-0.25	0	0.25	0
3*6	0	-0.25	-0.25	-0.25	-0.25	-0.25	0	0	0.25
3*6*8	0	0	0	0.25	0	0.25	0	0.25	-0.25
3*8	-0.25	-0.25	0	-0.25	0	-0.25	0.25	0	-0.25
6*8	0.25	0	0.25	-0.25	-0.25	0.25	-0.25	0.25	0.25
N	-0.25	0.25	0.25	-0.5	0	0	0.25	0	0
N*1	0	0.25	0	0	-0.25	-0.25	0.25	0.25	-0.25
N*1*3	0	0	0.25	0.25	0	0	0	0.25	0
N*1*3*6	-0.25	0.25	0	0	0.25	-0.25	-0.25	0.25	0.25
N*1*3*6*8	0	-0.25	0.25	0	0	-0.25	0	0	0.25
N*1*3*8	0	0	-0.25	0	0	0.25	0	-0.25	0.25
N*1*6	0.25	0.25	0	0	0.25	-0.25	0	-0.25	0.25
N*1*6*8	-0.25	0	-0.25	0.25	0	0	0	0	0
N*1*8	0.25	0	0	0	0.25	-0.25	0	0.25	0.25
N*3	0	-0.25	0.25	0	0	0	-0.25	-0.25	-0.25
N*3*6	-0.25	-0.25	0	0	0	0.25	0.25	0	0.25
N*3*6*8	-0.25	-0.25	0.25	0	0	0	0	0	0.25

N*3*8	-0.25	0.25	0.25	0.25	-0.25	0	-0.25	0	0
N*6	0	0	0.25	-0.25	0.25	0	-0.25	-0.25	-0.25
N*6*8	0.25	-0.25	0	0	-0.25	0	-0.25	0.25	0
N*8	-0.25	0	-0.25	0	-0.25	-0.25	-0.5	-0.25	0

Last 9 generators

Term	23	24	25	26	27	28	29	30	31
1*3	0	-0.25	0	-0.25	0	-0.25	0	0	0
1*3*6	0.25	0.25	0.25	0	0.25	0	0	-0.25	0.25
1*3*6*8	0.25	0	-0.25	-0.25	0	-0.25	0	0	0.25
1*3*8	0.25	-0.25	-0.25	-0.25	0.25	0	0.25	0.25	0.25
1*6	0.25	-0.25	0	0.25	0	-0.25	0	0	-0.25
1*6*8	0	0.25	0.25	-0.25	0.25	-0.25	0	0	0.25
1*8	0	-0.25	0	0.25	-0.25	0	0.25	0	0.25
3*6	0	0.25	0.25	0	-0.25	0	0	0.25	0
3*6*8	0	-0.25	0.25	0	-0.25	-0.25	-0.25	0	0.25
3*8	0.25	-0.25	0.25	-0.25	0	0.25	0	-0.25	0
6*8	-0.25	-0.25	0.25	-0.25	0	0	-0.25	0	-0.25
N	0	0	0	0	0	0	0	0	-0.25
N*1	-0.25	0	-0.25	0	0.25	-0.25	-0.25	0	0
N*1*3	0.25	0	0.25	0	0.25	0.25	0	0	0
N*1*3*6	-0.25	0	0	-0.25	0	-0.25	0.25	-0.25	0
N*1*3*6*8	-0.25	0	0	0	0	0	0	-0.25	0.25
N*1*3*8	0	-0.25	0	0	-0.25	0	0	-0.5	0
N*1*6	0.25	-0.25	0.25	0.25	0.25	-0.25	0	0	0
N*1*6*8	0	0	0	-0.25	0.25	0.25	-0.25	-0.25	-0.25
N*1*8	0.25	0	-0.25	-0.25	-0.25	0.25	-0.25	0.25	0
N*3	0	0.25	0	-0.25	0	-0.25	0.25	0	-0.25
N*3*6	-0.25	0	0.25	0.25	0.25	0	0	0.25	0
N*3*6*8	0.25	0.25	-0.25	0.25	0	-0.25	-0.5	-0.25	0
N*3*8	0.25	0.25	0.25	0	-0.25	0	0	0	0
N*6	-0.25	0	0	0	0	0.25	-0.25	0	0.5
N*6*8	0	0	-0.25	0.25	0.25	0.25	0.25	-0.25	0
N*8	0	-0.25	0	0	0.25	0	-0.25	0.25	0

4. Pigeon and McAllister's 2^{7-3} with partial replication, with augmented column

A	B	C	D	E	F	G	N
-1	-1	1	-1	-1	-1	-1	-1
-1	-1	1	-1	1	-1	1	1
-1	-1	1	1	-1	1	-1	1
-1	-1	1	1	1	1	1	-1
-1	1	-1	-1	-1	-1	-1	-1
-1	1	-1	-1	1	-1	1	1
-1	1	-1	1	-1	1	-1	1
-1	1	-1	1	1	1	1	-1
1	-1	-1	-1	1	1	-1	-1
1	-1	-1	-1	1	1	-1	1
1	-1	-1	1	-1	-1	1	-1
1	-1	-1	1	-1	-1	1	1
1	1	1	-1	-1	1	1	-1
1	1	1	-1	-1	1	1	1
1	1	1	1	1	-1	-1	-1
1	1	1	1	1	-1	-1	1

5. Matlab code for symbolic computations

```

% Compute Defining Relation for Table 1 Design I
syms A B C D E F G W1 W2 W12
W1 = 0.25*F*(B*E - C*D + 2*A*B*C + A*B*E + A*C*D + B*C*E + B*D*E -
B*C*D - C*D*E + A*B*D*E + A*C*D*E - A*B*C*D - A*B*C*E)
W2 = 0.25*G*(A*C + A*E + C*D - B*C - 2*B*D*E + A*B*E - A*D*E + B*C*E +
C*D*E + A*B*C*E + A*B*D*E + A*C*D*E - A*B*C*D)
W12=expand(W1*W2);
W12=subs(W12,A^2,1);
W12=subs(W12,B^2,1);
W12=subs(W12,C^2,1);
W12=subs(W12,D^2,1);
W12=subs(W12,E^2,1)
% Result W12 = (A*C*F*G)/4 + (B*C*F*G)/4 + (A*E*F*G)/4 - (B*E*F*G)/4 +
(A*C*D*F*G)/4 + (B*C*D*F*G)/4 + (B*C*E*F*G)/2 - (A*D*E*F*G)/4 +
(B*D*E*F*G)/4 - (A*C*D*E*F*G)/2

% Compute Indicator Function for Table 1 Design II
syms A B C D E F G N W1 W2 W3 INDFUNC
W1= 0.25*A*(F*G-F*N-D*G-E*N+2*D*E*F+D*E*G+D*E*N-E*G*N-
D*F*N+D*G*N+E*F*G+D*F*G*N+E*F*G*N)
W2= 0.25*B*(2*D*N-E*F+E*G-F*N+G*N+2*D*F*G*N -D*E*F+D*E*G+D*F*N-D*G*N)
W3= 0.25*C*(2*G*N+D*E-D*F+F*N-D*E*G+D*E*N+D*F*G-
E*F*N+F*G*N+E*F*G*N+D*E*G*N-D*E*F*N-D*E*F*G*N)
INDFUNC=expand(W1+W2+W3+W1*W2+W1*W3+W2*W3+W1*W2*W3);
INDFUNC=subs(INDFUNC,N^3,N);
INDFUNC=subs(INDFUNC,D^3,D);
INDFUNC=subs(INDFUNC,E^3,E);
INDFUNC=subs(INDFUNC,F^3,F);
INDFUNC=subs(INDFUNC,G^3,G);
INDFUNC=subs(INDFUNC,N^2,1);
INDFUNC=subs(INDFUNC,D^2,1);
INDFUNC=subs(INDFUNC,E^2,1);
INDFUNC=subs(INDFUNC,F^2,1);
INDFUNC=subs(INDFUNC,G^2,1);
INDFUNC=subs(INDFUNC,N,0);
INDFUNC=(1+INDFUNC)/4

% Result INDFUNC =(C*D*E)/16 - (A*D*G)/16 - (A*B*C)/16 - (B*E*F)/16 -
(C*D*F)/16 + (A*F*G)/16 + (B*E*G)/16 + (A*B*C*D)/16 + (A*B*C*E)/16 -
(A*B*C*F)/16 + (A*B*C*G)/16 + (A*C*D*E)/16 - (A*B*D*G)/16 +
(A*B*E*F)/16 + (A*C*D*F)/16 + (B*C*D*E)/16 - (A*B*E*G)/16 -
(A*C*D*G)/16 + (B*C*D*F)/16 + (A*B*F*G)/16 + (B*C*D*G)/8 + (B*C*E*F)/16
+ (A*D*E*F)/8 - (A*C*F*G)/16 - (B*C*E*G)/16 + (A*D*E*G)/16 -
(B*D*E*F)/16 + (B*D*E*G)/16 + (A*E*F*G)/16 - (C*D*E*G)/16 +
(C*D*F*G)/16 - (A*B*D*E*F)/16 - (B*C*D*E*F)/16 + (A*B*E*F*G)/16 +
(A*C*D*F*G)/16 - (A*C*E*F*G)/16 + (B*C*D*F*G)/16 + (A*B*C*E*F*G)/8 +
(A*B*C*D*E*F*G)/16 + 1/4

```



```

% Compute Indicator Function for Table 1 Design III and
% Defining Relation for OA(32,2^8) Design that Projects to Design III
syms A B C D E F G N W1 W2 W3 INDFUNC
W1 = 0.25*A*G*(B+E+E*F-B-F)+0.25*N*A*(2*B*E+B+E*G+F*G+B*E*G+B*F*G -E-
B*F-E*F)
W2 = 0.25*C*N*(B+E*F+B*E*F*G-B*E*G-B*F*G-E*F*G) +
0.25*C*(2*B*E*F*G+B*E+B*F+B*E*F+E*F*G-B*G-E*F)
W3 = 0.25*D*N*(F+G+B*E*G+E*F*G-B-B*F-E*G-
B*E*F)+0.25*D*(B*E+E*F+B*E*F+B*F*G+E*F*G+B*E*F*G-B*F-B*E*G)
% NOW MULTIPLY THESE
W12=expand(W1*W2);
W12=subs(W12,N^2,1);
W12=subs(W12,B^2,1);
W12=subs(W12,E^2,1);
W12=subs(W12,F^2,1);
W12=subs(W12,G^2,1)

W13=expand(W1*W3);
W13=subs(W13,N^2,1);
W13=subs(W13,B^2,1);
W13=subs(W13,E^2,1);
W13=subs(W13,F^2,1);
W13=subs(W13,G^2,1)

W23=expand(W2*W3);
W23=subs(W23,N^2,1);
W23=subs(W23,B^2,1);
W23=subs(W23,E^2,1);
W23=subs(W23,F^2,1);
W23=subs(W23,G^2,1)

W123=expand(W1*W23);
W123=subs(W123,N^2,1);
W123=subs(W123,B^2,1);
W123=subs(W123,E^2,1);
W123=subs(W123,F^2,1);
W123=subs(W123,G^2,1)
% The defining relation is I = W1 = W2 = W3 = W12 = W13 = W23 = W123
%
INDFUNC=expand(W1+W2+W3+W12+W13+W23+W123);
INDFUNC=subs(INDFUNC,N,0);
INDFUNC=(1+INDFUNC)/4

% Result INDFUNC = (B*C*D)/16 - (A*B*G)/16 + (B*C*E)/16 + (B*C*F)/16 +
(B*D*E)/16 - (B*C*G)/16 + (A*D*G)/16 - (B*D*F)/16 + (C*D*E)/16 -
(A*F*G)/16 + (C*D*G)/16 - (C*E*F)/16 + (D*E*F)/16 - (A*B*C*D)/16 -
(A*B*C*E)/16 + (A*B*C*F)/16 + (A*B*D*E)/16 + (A*B*D*F)/16 +
(A*C*D*E)/16 + (A*B*E*G)/16 - (A*C*E*F)/16 - (B*C*D*F)/16 +
(B*C*D*G)/16 + (B*C*E*F)/16 - (A*D*E*F)/16 + (A*C*F*G)/16 -
(A*D*E*G)/16 + (B*D*E*F)/16 - (B*D*E*G)/16 - (C*D*E*F)/16 +
(A*E*F*G)/16 + (B*D*F*G)/16 + (C*D*F*G)/16 + (C*E*F*G)/16 +
(D*E*F*G)/16 - (A*B*C*D*F)/16 - (A*B*C*D*G)/16 - (A*B*C*E*F)/16 +
(A*B*C*E*G)/16 + (A*B*D*E*F)/16 - (A*B*D*E*G)/16 + (A*C*D*E*F)/16 +
(A*C*D*E*G)/16 + (A*C*D*F*G)/16 + (B*C*D*F*G)/16 + (B*C*E*F*G)/8 -
(A*D*E*F*G)/16 + (B*D*E*F*G)/16 - (A*C*D*E*F*G)/8 + (A*B*C*D*E*F*G)/16
+ 1/4

```

```

% Compute Defining Relation for Table 2 Design 2
syms A B C D E F G W1 W2 W12
W1 = F*A*B*C*D
W2 = 0.5*E*G*(A*B + A*C + B*D - C*D)
W12=expand(W1*W2);
W12=subs(W12,A^2,1);
W12=subs(W12,B^2,1);
W12=subs(W12,C^2,1);
W12=subs(W12,D^2,1);
W12=subs(W12,E^2,1);
W12=factor(W12)
% Result W12 = -(E*F*G*(A*B - A*C - B*D - C*D))/2

% Compute Defining Relation for Table 2 Design 3
syms A B C D E F G W1 W2 W12
W1 = 0.5*A*B*C*F*(1 + D + E - D*E)
W2 = 0.5*D*E*G*(A + A*B + C - B*C)
W12=expand(W1*W2);
W12=subs(W12,A^2,1);
W12=subs(W12,B^2,1);
W12=subs(W12,C^2,1);
W12=subs(W12,D^2,1);
W12=subs(W12,E^2,1)
% Result W12 = (A*F*G)/4 - (C*F*G)/4 - (A*B*F*G)/4 - (B*C*F*G)/4 -
(A*D*F*G)/4 - (A*E*F*G)/4 + (C*D*F*G)/4 + (C*E*F*G)/4 + (A*B*D*F*G)/4 +
(A*B*E*F*G)/4 + (B*C*D*F*G)/4 + (B*C*E*F*G)/4 - (A*D*E*F*G)/4 +
(C*D*E*F*G)/4 + (A*B*D*E*F*G)/4 + (B*C*D*E*F*G)/4

% Compute Defining Relation for Table 2 Design 4
syms A B C D E F G W1 W2 W12
W1 = 0.5*D*E*F*(B + C + A*C - A*B)
W2 = 0.5*B*E*G*(C + D + A*D - A*C)
W12=expand(W1*W2);
W12=subs(W12,A^2,1);
W12=subs(W12,B^2,1);
W12=subs(W12,C^2,1);
W12=subs(W12,D^2,1);
W12=subs(W12,E^2,1);
W12=factor(W12)
% Result W12 = (C*F*G*(B + D + A*B - A*D))/2

% Compute Defining Relation for Table 2 Design 5
syms A B C D E F G W1 W2 W12
W1 = F*A*B*C*D*E
W2 = 0.5*A*G*(B + C + D - B*C*D)
W12=expand(W1*W2);
W12=subs(W12,A^2,1);
W12=subs(W12,B^2,1);
W12=subs(W12,C^2,1);
W12=subs(W12,D^2,1);
W12=subs(W12,E^2,1);
W12=factor(W12)
% Result W12 = (E*F*G*(B*C + B*D + C*D - 1))/2

```

% Compute Defining Relation for Table 3 Design d1

syms A B C D E F G W1 W2 W12

W1= 0.25*F*(A*B+A*C+A*D-A*E+C*D-A*C*D+B*C*D+C*D*E+2*A*C*D*E-A*B*C*E-
A*B*D*E+B*C*D*E-A*B*C*D*E)

W2= 0.25*G*(A*B-B*D+A*B*C+A*B*E-
B*C*D+B*D*E+A*B*C*E+2*A*B*D*E+B*C*D*E-2*A*B*C*D*E)

W12=expand(W1*W2);

W12=subs(W12,A^2,1);

W12=subs(W12,B^2,1);

W12=subs(W12,C^2,1);

W12=subs(W12,D^2,1);

W12=subs(W12,E^2,1)

% Result W12 = (B*C*F*G - B*F*G - A*F*G + B*E*F*G - C*D*F*G + A*B*C*F*G -
A*B*E*F*G + A*C*E*F*G + B*C*D*F*G - B*C*E*F*G + A*D*E*F*G - C*D*E*F*G +
A*B*D*E*F*G + A*C*D*E*F*G + B*C*D*E*F*G + A*B*C*D*E*F*G)/4

% Table 3 Design d2 (Design 95)

syms A B C D E F G W1 W2 W12

W1 = 0.25*F*(C*D+2*D*E+A*C*D-B*C*D-C*D*E+2*A*B*D*E- A*B*C*D+A*C*D*E -
B*C*D*E+A*B*C*D*E)

W2 = 0.25*G*(A*C-A*E+B*E+C*E+D*E+ A*B*C-A*C*D-A*C*E+2*A*B*C*E-
A*B*C*D- A*B*D*E+B*C*D*E+A*B*C*D*E)

W12=expand(W1*W2);

W12=subs(W12,A^2,1);

W12=subs(W12,B^2,1);

W12=subs(W12,C^2,1);

W12=subs(W12,D^2,1);

W12=subs(W12,E^2,1)

% Result W12 = 0.25*(A*C*F*G - E*F*G + C*D*F*G + A*B*C*F*G + A*B*E*F*G -
B*C*D*F*G - B*C*E*F*G - A*D*E*F*G + B*D*E*F*G + 2*A*B*C*D*F*G - A*B*C*E*F*G
+ B*C*D*E*F*G + A*B*C*D*E*F*G)

% Table 3 Design 90 d3

syms A B C D E F G W1 W2 W12

W1=0.25*F*(B*D-A*B-A*C+A*B*E+A*C*D+A*C*E-
B*C*D+B*D*E+2*A*B*D*E+A*B*C*D-A*C*D*E-B*C*D*E+A*B*C*D*E)

W2=0.25*G*(A*B+A*D-B*C-A*B*E+A*C*D+A*D*E-B*C*D+B*C*E+2*A*B*D*E-
A*B*C*D+A*C*D*E+B*C*D*E-A*B*C*D*E)

W12=expand(W1*W2);

W12=subs(W12,A^2,1);

W12=subs(W12,B^2,1);

W12=subs(W12,C^2,1);

W12=subs(W12,D^2,1);

W12=subs(W12,E^2,1)

% result W12=0.25*(A*F*G + B*F*G + A*E*F*G + B*E*F*G + A*C*D*F*G -
2*A*C*E*F*G + B*C*D*F*G + 2*B*C*E*F*G - A*C*D*E*F*G - B*C*D*E*F*G)

```

% Table 3 Design d7
syms A B C D E F G W1 W2 W12
W1=0.25*F*(-3*A*B*C*E+A*B*D*E+A*C*D*E+A*E-B*C*D*E-B*E-C*E-D*E)
W2 = 0.25*G*(A*C+A*E-B*C-B*E+C*D+D*E+3*A*B*C*D-A*B*D*E)
W12=expand(W1*W2);
W12=subs(W12,A^2,1);
W12=subs(W12,B^2,1);
W12=subs(W12,C^2,1);
W12=subs(W12,D^2,1);
W12=subs(W12,E^2,1)
% Result W12=0.25*(B*C*F*G - A*C*F*G - C*D*F*G - C*E*F*G + 2*D*E*F*G +
A*B*C*D*F*G + A*B*C*E*F*G + 2*A*B*D*E*F*G + A*C*D*E*F*G - B*C*D*E*F*G)

% Table 3 Design d13
syms A B C D E F G W1 W2 W12
W1 = 0.25*F*(-A*B*C*D-A*B*C*D*E-A*B*C*E+A*B*D*E-A*C+A*C*D+
A*C*D*E+A*D-B*C-B*C*D+B*C*D*E-B*D-C*D+C*D*E-C*E-D*E)

W2 = 0.25*G*(A*B-A*B*C-A*B*C*D*E+A*B*C*E-2*A*B*D*E-A*C*D*E-
A*E+B*C*D+B*C*D*E+B*C*E-B*D-C*E-D*E)
W12=expand(W1*W2);
W12=subs(W12,A^2,1);
W12=subs(W12,B^2,1);
W12=subs(W12,C^2,1);
W12=subs(W12,D^2,1);
W12=subs(W12,E^2,1)
% Result W12 = 0.25*( C*D*F*G - B*C*F*G - A*F*G + A*B*D*F*G + A*B*E*F*G +
A*C*E*F*G - B*C*E*F*G - A*D*E*F*G - C*D*E*F*G + A*B*C*E*F*G + A*C*D*E*F*G +
2*B*C*D*E*F*G + A*B*C*D*E*F*G)

```

```

% Bulutoglu and Kaziska's maximal 12-7 design
syms A B C D E F G H J K L M W1 W2 W3 W4 W5 W6 W7 Wall
W1=F*(0.25*A*B+0.5* B*C-0.25* A*B*C-0.25* A*D-0.25* A*C*D-0.25*
A*E-0.25* A*C*E+0.25* A*B*D*E-0.5* B*C*D*E-0.25* A*B*C*D*E)
W2=G*(-0.25* A*B-0.25* A*C+0.25* B*C-0.25* A*B*C+0.25*
A*B*D+0.25* C*D+0.25* A*B*E+0.25* C*E-0.25* D*E-0.25* A*D*E+0.25*
B*D*E+0.25* C*D*E+0.5* A*B*C*D*E)
W3=H*(-0.5* A*B+0.25* A*C+0.25* B*C+0.25* C*D-0.25* A*B*C*D-
0.25* B*E-0.25* A*B*E-0.25* A*C*E-0.25* A*B*C*E-0.25* B*D*E+0.25*
A*B*D*E-0.25* C*D*E+0.25* B*C*D*E)
W4=J*(-0.25* A*C+0.25* B*C+0.25* B*D-0.25* A*B*D-0.25*
C*D+0.25* B*C*D-0.25* A*E+0.25* B*E+0.25* D*E-0.25* B*D*E+0.5*
A*C*D*E+0.25* B*C*D*E+0.25* A*B*C*D*E)
W5=K*(-0.25* A*B-0.25* A*C-0.25* B*C-0.25* A*B*C-0.25* A*B*D-
0.25* A*C*D+0.25* B*C*D+0.25* A*B*C*D+0.25* B*E-0.25* C*E+0.25*
B*C*E-0.25* A*B*C*E-0.25* D*E+0.25* A*D*E+0.25* A*B*D*E-0.25*
A*C*D*E)
W6=L*(-0.5* A*C-0.5* A*B*C*D+0.25* A*E-0.25* A*B*E+0.25*
C*E+0.25* B*C*E+0.25* A*D*E-0.25* A*B*D*E-0.25* C*D*E-0.25*
B*C*D*E)
W7=M*(-0.25* B*C-0.25* A*B*C-0.25* A*D+0.25* A*B*D+0.25*
C*D+0.25* A*B*C*D-0.25* A*E+0.25* B*E-0.5* A*B*E+0.25* C*E-
0.25* B*C*E-0.25* B*D*E-0.25* A*B*D*E)
% NOW MULTIPLY THESE
for a=0:1
    for b=0:1
        for c=0:1
            for d=0:1
                for e=0:1
                    for f=0:1
                        for g=0:1

Wall=expand(W1^a*W2^b*W3^c*W4^d*W5^e*W6^f*W7^g);
                                for i=3:2:7
                                    Wall=subs(Wall,A^i,A);

Wall=subs(Wall,B^i,B);
Wall=subs(Wall,C^i,C);
Wall=subs(Wall,D^i,D);
Wall=subs(Wall,E^i,E);

                                end
                                for i=2:2:6
                                    Wall=subs(Wall,A^i,1);

Wall=subs(Wall,B^i,1);
Wall=subs(Wall,C^i,1);
Wall=subs(Wall,D^i,1);
Wall=subs(Wall,E^i,1);

                                end
                                [a,b,c,d,e,f,g]
                                expand(4*Wall)
                                end
                            end
                        end
                    end
                end
            end
        end
    end
end

```

```

% Sixteen run, 8 factors
syms A B C D E F G H W1 W2 W3 W4 Wall
W1=0.5*E*D*(C + B + A*C - A*B)
W2=0.5*F*B*(D + C + A*D - A*C)
W3=0.5*G*B*C*(1 + D + A - A*D)
W4=-0.5*H*C*D*(1 + B + A*B - A)
% NOW MULTIPLY THESE
for a=0:1
    for b=0:1
        for c=0:1
            for d=0:1
                Wall=expand(W1^a*W2^b*W3^c*W4^d);
            for i=3
                Wall=subs(Wall,A^i,A);
                Wall=subs(Wall,B^i,B);
                Wall=subs(Wall,C^i,C);
                Wall=subs(Wall,D^i,D);
            end

            for i=2:2:4
                Wall=subs(Wall,A^i,1);
                Wall=subs(Wall,B^i,1);
                Wall=subs(Wall,C^i,1);
                Wall=subs(Wall,D^i,1);
            end
            expand(Wall)
        end
    end
end
end
end
end

```

```

% Strength 4 OA(128,2^15)
syms A B C D E F G H J K L M N O P W1 W2 W3 W4 W5 W6 W7 W8 Wall
W1=A*B*C*E*F*G*H
W2=0.5*J*(A*B*C*D*G+A*D*E*F*G+C*D*E*G-B*D*F*G)
W3=0.5*K*(A*D*F*G+B*D*E*F*G+C*D*E*F-A*B*C*D*F)
W4=0.5*L*(A*C*D*E*F+B*C*D*E*G+B*C*D*F-A*C*D*G)
W5=0.5*M*(A*B*C*D*E+A*D*E*G+B*D*E*F-C*D*E*F*G)
W6=0.5*N*(A*B*D*E*F+A*B*D*G+B*C*D*F*G-B*C*D*E)
W7=0.5*O*(A*B*D*F+A*C*D*E+A*C*D*F*G-A*B*D*E*G)
W8=0.5*P*(A*B*C*D+B*D*E*G+C*D*F*G-A*D*E*F)
% NOW MULTIPLY THESE
for a=0:1
    for b=0:1
        for c=0:1
            for d=0:1
                for e=0:1
                    for f=0:1
                        for g=0:1
                            for h=0:1

Wall=expand(W1^a*W2^b*W3^c*W4^d*W5^e*W6^f*W7^g*W8^h);
                                for i=3:2:7
                                    Wall=subs(Wall,A^i,A);

Wall=subs(Wall,B^i,B);
Wall=subs(Wall,C^i,C);
Wall=subs(Wall,D^i,D);
Wall=subs(Wall,E^i,E);
Wall=subs(Wall,F^i,F);
Wall=subs(Wall,G^i,G);

                                end
                                for i=2:2:8
                                    Wall=subs(Wall,A^i,1);

Wall=subs(Wall,B^i,1);
Wall=subs(Wall,C^i,1);
Wall=subs(Wall,D^i,1);
Wall=subs(Wall,E^i,1);
Wall=subs(Wall,F^i,1);
Wall=subs(Wall,G^i,1);

                                end
                                expand(Wall)
                            end
                        end
                    end
                end
            end
        end
    end
end
end
end
end

```

```

% Strength 4 OA(128,2^19)
syms A B C D E F G H J K L M N O P Q R S T W1 W2 W3 W4 W5 W6 W7 W8 W9
W10 W11 Wall
W1=A*B*C*E*F*G*H
W2=0.5*J*(A*B*C*D*G+A*D*E*F*G+C*D*E*G-B*D*F*G)
W3=0.5*K*(A*D*F*G+B*D*E*F*G+C*D*E*F-A*B*C*D*F)
W4=0.5*L*(A*C*D*E*F+B*C*D*E*G+B*C*D*F-A*C*D*G)
W5=0.5*M*(A*B*C*D*E+A*D*E*G+B*D*E*F-C*D*E*F*G)
W6=0.5*N*(A*B*D*E*F+A*B*D*G+B*C*D*F*G-B*C*D*E)
W7=0.5*O*(A*B*D*F+A*C*D*E+A*C*D*F*G-A*B*D*E*G)
W8=0.5*P*(A*B*C*D+B*D*E*G+C*D*F*G-A*D*E*F)
W9=0.5*R*F*Q*(A*B*G+A*C+B*C*E-E*G)
W10=0.5*S*E*Q*(A*C*G+B*C*F-A*B+F*G)
W11=0.5*T*Q*(A*B*E+A*C*F-B*C*G+E*F*G)
for a=0:1
    for b=0:1
        for c=0:1
            for d=0:1
                for e=0:1
                    for f=0:1
                        for g=0:1
                            for h=0:1
                                for i=0:1
                                    for j=0:1
                                        for k=0:1
%Restrict to products of 4 or fewer words to reduce output
                                            if a+b+c+d+e+f+g+h+i+j+k<5
Wall=expand(W1^a*W2^b*W3^c*W4^d*W5^e*W6^f*W7^g*W8^h*W9^i*W10^j*W11^k);
                                                for i=3:2:11
                                                    Wall=subs(Wall,A^i,A);
Wall=subs(Wall,B^i,B);
Wall=subs(Wall,C^i,C);
Wall=subs(Wall,D^i,D);
Wall=subs(Wall,E^i,E);
Wall=subs(Wall,F^i,F);
Wall=subs(Wall,G^i,G);
Wall=subs(Wall,Q^i,Q);
                                                    end
                                                for i=2:2:10
                                                    Wall=subs(Wall,A^i,1);
Wall=subs(Wall,B^i,1);
Wall=subs(Wall,C^i,1);
Wall=subs(Wall,D^i,1);
Wall=subs(Wall,E^i,1);
Wall=subs(Wall,F^i,1);
Wall=subs(Wall,G^i,1);
Wall=subs(Wall,Q^i,1);
                                                    end
                                                expand(Wall)
                                                    end
                                                end
                                            end
                                        end
                                    end
                                end
                            end
                        end
                    end
                end
            end
        end
    end
end
end
end
end
end
end
end
end
end
end
end
end

```



```

% Only Type 2, Strength 3 OA with n=32, k=8
syms A B C D E F G H N W1 W2 W3 W4 Wall INDFUNC
W1=E*(0.5*A*B*(C+D)+0.5*A*N*(1-C*D))
W2 =F*( 0.5*A*C*(B+D)+0.5*A*N*(B*D-1))
W3 =G*( 0.5*C*D*(A+B)+ 0.25*N*(A+D+A*C*D+A*B*C-B-C-A*B*D-B*C*D))
W4 = H*(0.5*B*D*(C-A)+ 0.25*N*(A+B+C+A*B*C+A*B*D+B*C*D-D-A*C*D))
Wall=expand(W1+W2+W3+W4+W1*W2+W1*W3+W1*W4+W2*W3+W2*W4+W3*W4+W1*W2*W3+W1
*W2*W4+W1*W3*W4+W2*W3*W4+W1*W2*W3*W4);
Wall=subs(Wall,A^3,A);
Wall=subs(Wall,B^3,B);
Wall=subs(Wall,C^3,C);
Wall=subs(Wall,D^3,D);
Wall=subs(Wall,N^3,N);
Wall=subs(Wall,A^2,1);
Wall=subs(Wall,B^2,1);
Wall=subs(Wall,C^2,1);
Wall=subs(Wall,D^2,1);
Wall=subs(Wall,N^2,1);
Wall=subs(Wall,A^4,1);
Wall=subs(Wall,B^4,1);
Wall=subs(Wall,C^4,1);
Wall=subs(Wall,D^4,1);
Wall=subs(Wall,N^4,1);
Wall=subs(Wall,N,0);
INDFUNC = (1+Wall)/8

% Result INDFUNC = (A*B*C*E)/16 + (A*B*C*F)/16 + (A*B*D*E)/16 +
(A*C*D*F)/16 - (A*B*D*H)/16 + (A*C*D*G)/16 + (A*B*F*G)/16 +
(B*C*D*G)/16 + (A*C*E*H)/16 + (B*C*D*H)/16 + (B*C*E*G)/16 +
(A*D*E*G)/16 + (B*D*E*F)/16 + (A*B*G*H)/16 + (C*D*E*F)/16 -
(A*C*G*H)/16 - (B*C*F*H)/16 + (A*D*F*H)/16 + (A*E*F*G)/16 +
(B*D*F*G)/16 - (A*E*F*H)/16 - (C*D*E*H)/16 + (B*E*F*H)/16 +
(C*E*F*G)/16 - (B*E*G*H)/16 + (C*F*G*H)/16 + (D*E*G*H)/16 -
(D*F*G*H)/16 + 1/8

```

```

% Pigeon and McAllister 16-run, 7-factor design
syms A B C D E F G N W1 W2 W3 W4 Wall INDFUNC
W1=A*B*C
W2=0.5*D*E*(B-N+A*B+A*N)
W3=-A*D*F
W4=-0.5*D*G*(B+N+A*B-A*N)
% NOW MULTIPLY THESE
INDFUNC = 0;
for a=0:1
    for b=0:1
        for c=0:1
            for d=0:1
                Wall=expand(W1^a*W2^b*W3^c*W4^d);
                for i=3
                    Wall=subs(Wall,A^i,A);
                end
                Wall=subs(Wall,B^i,B);
                Wall=subs(Wall,D^i,D);
                Wall=subs(Wall,N^i,N);
                for i=2:2:4
                    Wall=subs(Wall,A^i,1);
                end
                Wall=subs(Wall,B^i,1);
                Wall=subs(Wall,D^i,1);
                Wall=subs(Wall,N^i,1);
                expand(Wall)
            INDFUNC=INDFUNC+Wall;
        end
    end
end

% This is the resulting defining relation for the 8-factor Type 1
% design.

% Result I = A*B*C = -A*D*F = -A*E*G = D*E*F*G = -B*C*D*F = -B*C*E*G =
A*B*C*D*E*F*G = 0.5*( A*D*G*N - D*G*N - A*B*D*G - B*D*G) = 0.5*(
A*E*F*N - E*F*N - A*B*E*F - B*E*F) = 0.5*( B*C*D*G*N - A*C*D*G - C*D*G
- A*B*C*D*G*N) = 0.5*( B*C*E*F*N - A*C*E*F - C*E*F - A*B*C*E*F*N) =
0.5*( B*D*E - D*E*N + A*B*D*E + A*D*E*N) = 0.5*( B*F*G - F*G*N +
A*B*F*G + A*F*G*N) = 0.5*( C*D*E + A*C*D*E + B*C*D*E*N - A*B*C*D*E*N) =
0.5*( C*F*G + A*C*F*G + B*C*F*G*N - A*B*C*F*G*N)

% Drop terms involving N to get terms of indicator function.
% Note that INDFUNC already has 1 added from the (a,b,c,d)=(0,0,0,0).

INDFUNC=subs(INDFUNC,N,0);
INDFUNC=INDFUNC/8

% Result INDFUNC = (A*B*C)/8 - (A*D*F)/8 + (B*D*E)/16 + (C*D*E)/16 -
(A*E*G)/8 - (B*D*G)/16 - (B*E*F)/16 - (C*D*G)/16 - (C*E*F)/16 +
(B*F*G)/16 + (C*F*G)/16 + (A*B*D*E)/16 + (A*C*D*E)/16 - (A*B*D*G)/16 -
(A*B*E*F)/16 - (A*C*D*G)/16 - (A*C*E*F)/16 - (B*C*D*F)/8 + (A*B*F*G)/16
+ (A*C*F*G)/16 - (B*C*E*G)/8 + (D*E*F*G)/8 + (A*B*C*D*E*F*G)/8 + 1/8

```