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Note

A Symmetric Design with Parameters 2-(49, 16, 5)

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A symmetric 2-design with parameters $(v, k, \lambda) = (49, 16, 5)$ is constructed. Both this design and its residual, a design with parameters $(v, b, r, k, \lambda) = (33, 48, 16, 11, 5)$, seem to be new. The derived designs do not have repeated blocks. The group of the design is cyclic of order 15. There is no polarity.

The following matrix denotes the 49×49 point-block incidence matrix of the design.

*				j^T	j^T	j^T						
	*			j^T				j^T	j^T			
		*			j^T		j^T		j^T			
			*			j^T	j^T	j^T				
j	j				01	03	0	02	12	0	01	24
j		j		03		01	12	0	02	24	0	01
j			j	01	03		02	12	0	01	24	0
		j	j	0	23	14		23	13	4	04	24
	j		j	14	0	23	13		23	24	4	04
	j	j		23	14	0	23	13		04	24	4
				0	01	02	1	34	03	0134	3	2
				02	0	01	03	1	34	2	0134	3
				01	02	0	34	03	1	3	2	0134

.

Here j denotes a 5×1 all-1 matrix, * a 1-entry, blanks are 0-entries, and a string of digits denotes the sum of the corresponding powers of the 5×5 permutation matrix

$$P = \begin{bmatrix} 01000 \\ 00100 \\ 00010 \\ 00001 \\ 10000 \end{bmatrix}.$$

E.g., an entry 04 denotes

$$\begin{bmatrix} 10001 \\ 11000 \\ 01100 \\ 00110 \\ 00011 \end{bmatrix}.$$

This design has a full group of automorphisms of order 15 which acts in the obvious way on points and blocks: there are 5 point orbits and 5 block orbits. The design is not self-dual. The 10 residual designs (with parameters $(v, b, r, k, \lambda) = (16, 48, 15, 5, 4)$) are pairwise nonisomorphic and have groups of order 1, 5 or 15; consequently none of these is isomorphic to the well known design with these parameters. More details on these designs and other 2-(49, 16, 5) designs will be given in [1].

Reference

1. A. E. Brouwer and H. A. Wilbrink, Symmetric 2-(49, 16, 5) designs and related designs, internal report, Math. Centre Amsterdam, to appear.