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Caroline G Melles*, cgg@usna.edu, and **David Joyner**. *Bent p -ary functions and strongly regular graph decompositions.*

In a 1991 paper, T. S. Michael showed that a decomposition of a complete graph into three isomorphic strongly regular graphs forms an amorphic association scheme. Later, E. R. van Dam and Ja. Ju. Gol'fand, A. V. Ivanov, and M. Klin described further connections between strongly regular graphs and amorphic association schemes. We consider a decomposition of a complete graph on p^n vertices determined by a p -ary function of n variables. We show that if the graphs of the decomposition have feasible degrees and determine an amorphic association scheme, then the function is bent. Bent functions over a finite field can be thought of as maximally non-linear functions. In the Boolean ($p = 2$) case, Dillon discovered a simple combinatorial condition for a function to be bent. In graph-theoretic terms, a Boolean function is bent if and only if its Cayley graph is strongly regular with feasible Latin or negative Latin square type parameters. For primes $p > 2$, the Cayley graphs associated with a bent p -ary function are not necessarily strongly regular. We prove a generalized Dillon-type theorem in the other direction, giving graph-theoretic conditions which guarantee that a p -ary function is bent. (Received September 23, 2018)