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Tina Helms and **Heather Jordan*** (hdj@ams.org), 416 Fourth Street, Ann Arbor, MI 48103,
and **Maggie Murray** and **Stephanie Zeppetello**. *Extended Skolem-type Difference Sets*.

A k -extended Skolem-type 5-tuple difference set of order t is a set of t 5-tuples $\{(d_{i,1}, d_{i,2}, d_{i,3}, d_{i,4}, d_{i,5}) \mid i = 1, 2, \dots, t\}$ such that $d_{i,1} + d_{i,2} + d_{i,3} + d_{i,4} + d_{i,5} = 0$ for $1 \leq i \leq t$ and $\{|d_{i,j}| \mid 1 \leq i \leq t, 1 \leq j \leq 5\} = \{1, 2, \dots, 5t + 1\} \setminus \{k\}$. In this talk, we will give necessary and sufficient conditions on t and k for the existence of a k -extended Skolem-type 5-tuple difference set of order t . We will also consider hooked k -extended Skolem-type 5-tuple difference sets of order t and provide necessary and sufficient conditions for their existence. We will then show how these k -extended Skolem-type difference sets can be used to find decompositions of circulant and complete graphs of order n into 5-cycles, d -cycles, where d is a divisor of n , Hamilton cycles, and possibly a 1-factor. (Received September 24, 2012)