1043-05-8 **Alexander Giffen** and **Darren B Parker*** (parkerda@gvsu.edu), Department of Mathematics, 1 Campus Dr., Allendale, MI 49401-6495. *On Generalizing the "Lights Out" Game and a Generalization of Parity Domination.*

We study the following generalization of the game "Lights Out". Given a graph G and a labeling $\pi : V(G) \to \mathbb{Z}_k$, we play by toggling the vertices. Each time the vertex v is toggled, the labels of v and every vertex adjacent to v are increased by 1. The game is won when each vertex has label 0. In the case $k = 2$, the question of whether or not the game can be won is equivalent to the existence of a *parity domination set* (i.e. a set $S \subseteq V(G)$ such that for each $v \in V(G)$, the number of vertices in S of distance at most one from v has the same parity as $\pi(v)$). We use the more general form of Lights Out to define a generalization of parity domination sets, which we call $\mathbb{Z}_k$-domination multisets. Moreover, in the cases where G is a path, cycle, or complete bipartite graph, we characterize and count the labelings of G for which the game can be won. In particular, we determine for which of these graphs the game can be won regardless of the initial labeling. (Received May 14, 2008)