1077-05-2671 **Megan Cornett*** (cornett.megan@gmail.com) and **Ellen Sparks**. *On 2-fold graceful labelings of graphs.*

Let $\mathbb{Z}$ denote the set of integers and $\mathbb{N}$ denote the set of nonnegative integers. For integers a and b with $a \leq b$, let $[a,b] = \{x \in \mathbb{Z} : a \leq x \leq b\}$. For a positive integer k, let ${}^2K_k$ denote the 2-fold complete mutigraph of order k. Similarly, let ${}^2[a,b]$ denote the multiset that contains every element of $[a,b]$ exactly two times. Let G be a multigraph of size n, order at most $n+1$, and edge multiplicity at most 2. A *labeling* of G is a one-to-one function $f\colon V(G) \to \mathbb{N}$. If f is a labeling of G and $e = \{u,v\} \in E(G)$, let $\bar{f}(e) = |f(u) - f(v)|$. A 2-*fold graceful labeling* of G is a one-to-one function $f : V(G) \to [0,n]$ such that:

$$\{\bar{f}(e)\colon e \in E(G)\} = \begin{cases} {}^2[1, \frac{n}{2}] & \text{if } n \text{ is even,} \\ {}^2[1, \frac{n-1}{2}] \cup \{\frac{n+1}{2}\} & \text{if } n \text{ is odd.} \end{cases}$$

A graph G is 2-*fold graceful* if it admits a 2-*fold graceful labeling*. It can be shown that if G with n edges is 2-fold graceful, then there exists a cyclic G-decomposition of ${}^2K_{n+1}$. We investigate 2-fold graceful labelings of various classes of graphs including several classes of trees. (Received September 22, 2011)