Γ-supermagic labeling of some 4-regular graphs

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Let $G = (V, E)$ be a simple finite undirected graph with p vertices and q edges, and let Γ be a group of order q.

A bijection $f : \Gamma \to E$ is called a Γ-*supermagic labeling* of G if for every vertex x there exists an ordering of the edges incident with x such that the product of the edge labels (called the *weight* of the vertex) is the same element of Γ. In other words, for a vertex $x \in G$, we define its weight as

$$w(x) = \prod_{xy \in E} f(xy)$$

and say that f is a Γ-supermagic labeling if there exists $\mu \in \Gamma$ such that for every $x \in G$ there is an ordering of the edges incident with x giving

$$w(x) = \mu.$$

A graph G admitting a Γ-supermagic labeling is then called a Γ-*supermagic graph*. The labeling is also sometimes called a *vertex-magic edge* Γ-*labeling*.

So far, in all results on Γ-supermagic labeling we are aware of the group Γ is Abelian. We present a labeling of products of two cycles and some other graphs with the dihedral group D_n.

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