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*Circulant graphs and digraphs: Achromatic and diachromatic numbers and achromatic index*

A **complete**  $k$ -vertex-coloring of a graph  $G$  is a vertex-coloring of  $G$  using  $k$  colors such that for every pair of colors there is at least two incident vertices in  $G$  colored with this pair of colors. The **chromatic**  $\chi(G)$  and **achromatic**  $\alpha(G)$  numbers of  $G$  are the smallest and the largest number of colors in a complete proper  $k$ -vertex-coloring of  $G$ , therefore  $\chi(G) \leq \alpha(G)$ .

The dichromatic number and the diachromatic number, generalice the concepts of chromatic number and achromatic number. An **acyclic**  $k$ -vertex-coloring of a digraph  $D$  is vertex coloring using  $k$  colors such that  $D$  has no monochromatic cycles and a **complete**  $k$ -vertex-coloring of a digraph  $D$  is a vertex coloring using  $k$  colors such that for every ordered pair  $(i, j)$  of different colors, there is at least one arc  $(u, v)$  such that  $u$  has color  $i$  and  $v$  has color  $j$ . The dichromatic number  $dc(D)$  and diachromatic number  $dac(D)$  of  $D$  are the smallest and the largest number of colors in a complete proper  $k$ -vertex-coloring of  $D$ , therefore  $dc(D) \leq dac(D)$ .

We determine the achromatic and diachromatic numbers of some specific circulant graphs and digraphs and give general bounds for these two parameters on these graphs and digraphs. Also, we determine the achromatic index for circulant graphs of order  $q^2 + q + 1$  using projective planes.