The s-coloring of signed graphs

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The *sign* of a vertex in a signed graph be defined naturally as the product of signs of edges incident to the vertex. We say that an edge is *consistent* or a *c-edge* if its end-vertices have the same sign. Over the years, different notions of vertex coloring have been defined for signed graphs. Here, we introduce a new type of coloring in which any two vertices joined by a c-edge are assigned different colors. We call this the *s-coloring* of a signed graph. The s-chromatic number $\chi_s(G)$ of a signed graph G is the minimum number of colors required to properly s-color the vertices of G. We obtain several bounds for $\chi_s(G)$. We show that the number of s-colorings of a signed graph G is a polynomial function of the number k of colors, which we call the s-chromatic polynomial $S(G,k)$ of G. We define the operations of *removal* and *compression* to develop a deletion-contraction type recursive procedure for determining $S(G,k)$. We introduce the notions of c-complete and c-full signed graphs, characterizing different classes of c-full signed graphs and determining the number of c-complete signed graphs on a given number of vertices. Furthermore, the relationship between s-coloring and other signed graph colorings is also investigated.