GENERALIZED FRACTIONAL AND CIRCULAR COLORINGS

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An additive hereditary property of graphs is a class of simple graphs which is closed under unions, subgraphs and isomorphism. Let $\mathcal{P}$ and $\mathcal{Q}$ be additive hereditary properties of graphs. For positive integers r, s a *(weak)* $(\mathcal{P}, \mathcal{Q})$-*total fractional/circular* (r, s)-*coloring* of a simple graph G is a coloring of the vertices $V(G)$ and edges $E(G)$ of G by arbitrary/consecutive s-element subsets of $\mathbf{Z}_r$ such that for each color i the vertices colored by sets containing i induce a subgraph of property $\mathcal{P}$, the edges colored by sets containing i induce a subgraph of property $\mathcal{Q}$ and incident vertices and edges obtain disjoint sets. We present general basic results on $(\mathcal{P}, \mathcal{Q})$-total fractional/circular (r, s)-colorings. For specific properties we determine the $(\mathcal{P}, \mathcal{Q})$-total fractional and circular chromatic numbers of complete graphs.