

Classes of strongly regular signed graphs

Tamara Koledin

School of Electrical Engineering, University of Belgrade

tamara@etf.bg.ac.rs

Ivana Jovović

School of Electrical Engineering, University of Belgrade

ivana@etf.bg.ac.rs

Zoran Stanić

Faculty of Mathematics, University of Belgrade

zstanic@matf.bg.ac.rs

We consider a concept of strong regularity defined for signed graphs – a generalization of strong regularity of the unsigned ones. We say that the signed graph \dot{G} is *strongly regular* (for short, \dot{G} is a *SRSG*) whenever it is regular, neither homogeneous complete nor totally disconnected, and if its adjacency matrix $A_{\dot{G}}$ satisfies

$$A_{\dot{G}}^2 = \frac{a}{2}(A_{\dot{G}} + A_G) - \frac{b}{2}(A_{\dot{G}} - A_G) + cA_{\overline{G}} + rI,$$

where G and \overline{G} are the underlying graph of \dot{G} and its complement and r is the vertex degree of G (and \dot{G}).

We establish certain basic structural and spectral properties of such signed graphs, and suggest a natural way to divide all SRSGs into five classes according to the relations among their defining parameters, which allows us to better perceive their properties.

Next, we consider walk-regularity of SRSGs with a relatively small number of distinct eigenvalues, belonging to some of those specified classes. In the end, we investigate the relationship between SRSGs with three or four distinct eigenvalues and three-class symmetric association schemes.