Total graph of a signed graph

Francesco Belardo [ID]

*Department of Mathematics and Applications, University of Naples Federico II,
I-80126 Naples, Italy*

Zoran Stanić * [ID]

*Faculty of Mathematics, University of Belgrade, Studentski trg 16,
11 000 Belgrade, Serbia*

Thomas Zaslavsky [ID]

*Department of Mathematical Sciences, Binghamton University, Binghamton, NY
13902-6000, United States*

Abstract

The total graph is built by joining the graph to its line graph by means of the incidences. We introduce a similar construction for signed graphs. Under two similar definitions of the line signed graph, we define the corresponding total signed graph and we show that it is stable under switching. We consider balance, the frustration index and frustration number, and the largest eigenvalue. In the regular case we compute the spectrum of the adjacency matrix of the total graph and the spectra of certain compositions, and we determine some with exactly two main eigenvalues.

Keywords: Bidirected graph, signed line graph, signed total graph, graph eigenvalues, regular signed graph, Cartesian product graph.

Math. Subj. Class. (2020): 05C22, 05C50, 05C76.

Združeni graf predznačenega grafa

Francesco Belardo [iD]

*Department of Mathematics and Applications, University of Naples Federico II,
I-80126 Naples, Italy*

Zoran Stanić [*] [iD]

*Faculty of Mathematics, University of Belgrade, Studentski trg 16,
11 000 Belgrade, Serbia*

Thomas Zaslavsky [iD]

*Department of Mathematical Sciences, Binghamton University, Binghamton, NY
13902-6000, United States*

Povzetek

Združeni graf je zgrajen tako, da se graf združi z njegovim povezavnim grafom s pomočjo incidenc. Podobno konstrukcijo vpeljemo za predznačene grafe. Z dvema podobnima definicijama povezavnega predznačenega grafa definiramo ustrezen združeni predznačeni graf in pokažemo, da se le-ta pri operaciji preklapljanja ohranja. Upoštevamo ravnotežje, frustracijski indeks in frustracijsko število ter največjo lastno vrednost. V regularnem primeru izračunamo spekter matrike sosednosti združenega grafa in spektre določenih sestavov, in prikažemo tiste z natanko dvema glavnima lastnima vrednostma.

Ključne besede: Dvosmerni graf, predznačeni graf povezav, predznačeni združeni graf, lastne vrednosti grafa, pravilni predznačeni graf, graf kartezičnega produkta.

Math. Subj. Class. (2020): 05C22, 05C50, 05C76.