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On the automorphism groups of almost all circulant graphs and digraphs

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Abstract: We attempt to determine the structure of the automorphism group of a generic circulant graph. We first show that almost all circulant graphs have automorphism groups as small as possible. The second author has conjectured that almost all of the remaining circulant (di)graphs (those whose automorphism group is not as small as possible) are normal circulant (di)graphs. We show this conjecture is not true in general, but is true if we consider only those circulant (di)graphs whose order is in a "large" subset of integers. We note that all non-normal circulant (di)graphs can be classified into two natural classes (generalized wreath products, and deleted wreath type), and show that neither of these classes contains almost every non-normal circulant digraph.

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Keywords: Circulant graph, automorphism group, Cayley graph, DRR, GRR.

Grupe avtomorfizmov skoraj vseh cirkulantnih grafov in digrafov

Povzetek: Poskušamo določiti strukturo grupe avtomorfizmov generičnega cirkulantnega grafa. Najprej pokažemo, da imajo skoraj vsi cirkulantni grafi grupe avtomorfizmov tako majhne kot je le mogoče. Drugi avtor je postavil hipotezo, da so skoraj vsi preostali cirkulantni (di)grafi (tisti, katerih grupa avtomorfizmov ni tako majhna kot je le mogoče) normalni cirkulantni (di)grafi. Pokažemo, da ta hipoteza v splošnem ni resnična; je pa resnična za tiste cirkulantne (di)grafe, katerih red je v "veliki" podmnožici celih števil. Opazimo, da je vse ne-normalne cirkulantne (di)grafe mogoče klasificirati v dva naravna razreda (posplošeni venčni produkti in izbrisani venčni tipi) in pokažemo, da nobeden od teh dveh razredov ne vsebuje skoraj vseh ne-normalnih cirkulantnih digrafov.

Ključne besede: Cirkulanten graf, grupa avtomorfizmov, Cayleyev graf, DRR, GRR.