ON DECOMPOSING REGULAR GRAPHS INTO ISOMORPHIC DOUBLE-STARS

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Abstract

A *double-star* is a tree with exactly two vertices of degree greater than 1. If T is a double-star where the two vertices of degree greater than one have degrees $k_1 + 1$ and $k_2 + 1$, then T is denoted by S_{k_1, k_2} . In this note, we show that every double-star with n edges decomposes every $2n$ -regular graph. We also show that the double-star $S_{k, k-1}$ decomposes every $2k$ -regular graph that contains a perfect matching.

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REFERENCES

- [1] P. Adams, D. Bryant and M. Buchanan, *A survey on the existence of G -designs*, J. Combin. Des. **16** (2008) 373–410.
doi:10.1002/jcd.20170
- [2] D. Bryant and S. El-Zanati, *Graph decompositions*, in: Handbook of Combinatorial Designs, C.J. Colbourn and J.H. Dinitz (Ed(s)), (2nd Ed., Chapman & Hall/CRC, Boca Raton, 2007) 477–485.

- [3] S.I. El-Zanati, M.J. Plantholt and S. Tipnis, *On decomposing even regular multi-graphs into small isomorphic trees*, Discrete Math. **325** (2014) 47–51.
doi:10.1016/j.disc.2014.02.011
- [4] J.A. Gallian, *A dynamic survey of graph labeling*, Electron. J. Combin. **16** (2013) #DS6.
- [5] R. Häggkvist, *Decompositions of complete bipartite graphs*, London Math. Soc. Lecture Note Ser. C.U.P., Cambridge **141** (1989) 115–147.
- [6] M.S. Jacobson, M. Truszczyński and Zs. Tuza, *Decompositions of regular bipartite graphs*, Discrete Math. **89** (1991) 17–27.
doi:10.1016/0012-365X(91)90396-J
- [7] F. Jaeger, C. Payan and M. Kouider, *Partition of odd regular graphs into bistars*, Discrete Math. **46** (1983) 93–94.
doi:10.1016/0012-365X(83)90275-3
- [8] K.F. Jao, A.V. Kostochka and D.B. West, *Decomposition of Cartesian products of regular graphs into isomorphic trees*, J. Comb. **4** (2013) 469–490.
- [9] A. Kotzig, Problem 1, in: Problem session, Proceedings of the Tenth Southeastern Conference on Combinatorics, Graph Theory and Computing, Congr. Numer. **XXIV** (1979) 913–915.
- [10] G. Ringel, Problem 25, in: Theory of Graphs and its Applications, Proc. Symposium Smolenice 1963, Prague (1964), 162.
- [11] H. Snevily, Combinatorics of Finite Sets, Ph.D. Thesis, (University of Illinois 1991).

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