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GREGARIOUS KITE FACTORIZATION OF TENSOR PRODUCT OF COMPLETE GRAPHS

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Abstract

A kite factorization of a multipartite graph is said to be gregarious if every kite in the factorization has all its vertices in different partite sets. In this paper, we show that there exists a gregarious kite factorization of $K_m \times K_n$ if and only if $mn \equiv 0 \pmod 4$ and $(m-1)(n-1) \equiv 0 \pmod 2$, where $\times$ denotes the tensor product of graphs.

Keywords: tensor product, kite, decomposition, gregarious factor, factorization.

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References

[1] I. Anderson, Combinatorial Designs and Tournaments (Oxford University Press Inc., New York, 1997).

[2] R.J.R. Abel, C.J. Colbourn and J.H. Dinitz, *Mutually orthogonal latin squares* (*MOLS*), chapter in The Handbook of Combinatorial Designs, Second Edition, C.J. Colbourn and J.H. Dinitz, Eds., Discrete Math. Appl. (Chapman & Hall/CRC Press, Boca Raton, New York, 2007) 160–163.

[3] J.C. Bermond and J. Schönheim, *G-decompositions of K_n, where G has four vertices or less*, Discrete Math. **19** (1977) 113–120.
doi:10.1016/0012-365X(77)90027-9

[4] C.J. Colbourn, A.C.H. Ling and G.Quattrocchi, *Embedding path designs into kite systems*, Discrete Math. **297** (2005) 38–48.
doi:10.1016/j.disc.2005.04.014

[5] C.M. Fu, Y.F. Hsu, S.W. Lo and W.C. Huang, *Some gregarious kite decompositions of complete equipartite graphs*, Discrete Math. **313** (2013) 726–732.
doi:10.1016/j.disc.2012.10.017

[6] M. Gionfriddo and S. Milici, *On the existence of uniformly resolvable decompositions of K_v and $K_v - I$ into paths and kites*, Discrete Math. **313** (2013) 2830–2834.
doi:10.1016/j.disc.2013.08.023

[7] L. Gionfriddo and C.C. Lindner, *Nesting kite and 4-cycle systems*, Australas. J. Combin. **33** (2005) 247–254.

[8] R. Häggkvist, *Decompositions of complete bipartite graphs*, in: Surveys in Combinatorics, Lond. Math. Soc. Lecture Note Ser. **141** (1989) 115–147.
doi:10.1017/CBO9781107359949.007

[9] S. Kucukcifci and C.C. Lindner, *The metamorphosis of λ-fold block designs with block size four into λ-fold kite systems*, J. Combin. Math. Combin. Comput. **40** (2002) 241–252.

[10] C.C. Lindner and C.A. Rodger, Design Theory (Chapman & Hall/CRC Press, Taylor & Francis Group, Boca Raton, 2009).

[11] G. Lo Faro and A. Tripodi, *The Doyen-Wilson theorem for kite systems*, Discrete Math. **306** (2006) 2695–2701.
doi:10.1016/j.disc.2006.03.074

[12] G. Ragusa, *Complete simultaneous metamorphosis of λ-fold kite systems*, J. Combin. Math. Combin. Comput. **73** (2010) 159–180.

[13] D.K. Ray-Chaudhuri and R.M. Wilson, *Solution of Kirkman's schoolgirl problem*, Combinatorics, Proc. Symp. Pure Math., Amer. Math. Soc. **19** (1971) 187–204.
doi:10.1090/pspum/019/9959

[14] A. Tamil Elakkiya and A. Muthusamy, *P_3-factorization of triangulated Cartesian product of complete graphs*, Discrete Math. Algorithms Appl. **7** (2015) ID:1450066.
doi:10.1142/S1793830914500669

[15] A. Tamil Elakkiya and A. Muthusamy, *Gregarious kite decomposition of tensor product of complete graphs*, Electron. Notes Discrete Math. **53** (2016) 83–96.
doi:10.1016/j.endm.2016.05.008

[16] A. Tamil Elakkiya and A. Muthusamy, *P_3-factorization of triangulated Cartesian product of complete graph of odd order*, S. Arumugam *et al.* (Eds.), ICTCSDM 2016, Lecture Notes in Comput. Sci. **10398** (2017) 425–434.
doi:10.1007/978-3-319-64419-6_54

[17] L. Wang, *On the existence of resolvable $(K_3 + e)$-group divisible designs*, Graphs Combin. **26** (2010) 879–889.
doi:10.1007/s00373-010-0954-5

[18] H. Wang and Y. Chang, *Kite-group divisible designs of type $g^t u^1$*, Graphs Combin. **22** (2006) 545–571.
doi:10.1007/s00373-006-0681-0

[19] H. Wang and Y. Chang, (K_3+e, λ)*-group divisible designs of type* $g^t u^1$, Ars Combin. **89** (2008) 63–88.

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