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Equitably 2-colourable cycle systems

An ℓ -cycle decomposition of a graph G is said to be equitably c -colourable if there is a c -vertex-colouring of G such that each colour is represented (approximately) an equal number of times on each cycle: more precisely, we ask that in each cycle C of the decomposition, each colour appears on $\lfloor \ell/c \rfloor$ or $\lceil \ell/c \rceil$ of the vertices of C . In this talk, we consider the case $c = 2$ and present some new results on the existence of 2-colourable even ℓ -cycle systems of the cocktail party graph $K_v - I$. In particular, we determine a complete existence result for equitably 2-colourable ℓ -cycle decompositions of $K_v - I$, ℓ even, in the cases that $v \equiv 0, 2 \pmod{\ell}$, or ℓ is a power of 2, or $\ell \in \{2q, 4q\}$ for q an odd prime power, or $\ell \leq 30$. We will also discuss some work in progress on analogous problems for cycles of odd length.

(Joint work with Andrea Burgess)