Meeting: 1003, Atlanta, Georgia, SS 24A, AMS Special Session on Design Theory and Graph Theory, I

1003-05-42 **Anthony J.W. Hilton*** (a.j.w.hilton@reading.ac.uk), Department of Mathematics, University of Reading, Whiteknights, P.O. Box 220, Reading, England. *(r,r+1)-factorizations of (d,d+1)-graphs.*

A $(d, d+1)$- *graph* is a graph whose vertices all have degrees d or $d+1$. A decomposition of a graph into edge-disjoint $(r, r+1)$-factors (i.e. spanning $(r, r+1)$-subgraphs) is called an $(r, r+1)$-*factorization*.

We show that if $r, d, x \in \mathbb{Z}^+$ and $x \in \left(\frac{d+1}{r+1}, \frac{d}{r}\right)$ then any simple $(d, d+1)$-graph has an $(r, r+1)$-factorization into x $(r, r+1)$-factors, and that if

$$x \notin \left[\frac{d+1}{r+1}, \frac{d}{r}\right]$$

then no simple $(d, d+1)$-graph has an $(r, r+1)$-factorization into x $(r, r+1)$-factors.

Let $\psi(r)$ be the least integer such that, if $d \geq \psi(r)$, then any d-regular simple graph has an $(r, r+1)$-factorization. We show that

$$\psi(d) = \begin{cases} r(r+1) & \text{when } r \text{ is even ,} \\ r(r+1)+1 & \text{when } r \text{ is odd .} \end{cases}$$

Multigraphs and pseudographs are also considered. Results for multigraphs, like the ones above, may be true, but have yet to be proved. (Received June 29, 2004)