Vertex Partitions into an Independent Set and a Forest with Each Component Small

Daniel Cranston
Virginia Commonwealth University

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Abstract: For each integer $k \geq 2$, we determine a sharp bound on $\mathrm{mad}(G)$ such that $V(G)$ can be partitioned into sets I and F_k, where I is an independent set and $G[F_k]$ is a forest in which each component has at most k vertices. For each k we construct an infinite family of examples showing our result is best possible. Hendrey, Norin, and Wood asked for the largest function $g(a, b)$ such that if $\mathrm{mad}(G) < g(a, b)$ then $V(G)$ has a partition into sets A and B such that $\mathrm{mad}(G[A]) < a$ and $\mathrm{mad}(G[B]) < b$. They specifically asked for the value of $g(1, b)$, which corresponds to the case that A is an independent set. Previously, the only values known were $g(1, 4/3)$ and $g(1, 2)$. We find the value of $g(1, b)$ whenever $4/3 < b < 2$. This is joint work with Matthew Yancey.

Address: No 2005 Songhu Road Shanghai China Email: scms@fudan.edu.cn www.scms.fudan.edu.cn