A New Labeling for Decomposing Complete Graphs into Bipartite or Tripartite Graphs

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Let G be a graph with m edges. If G is a subgraph of K_n and $n \equiv 0$ or $1 \pmod{2m}$, then a G-decomposition of K_n may exist. Furthermore, if m is odd and $n \equiv m$ or $m+1 \pmod{2m}$, then a G-decomposition may exist as well. In the 1960s, Alex Rosa introduced a new technique for constructing G-decompositions we now know as graph labeling. Since then, his labelings have been added to and generalized, but they only address the cases $n \equiv 0$ or $1 \pmod{2m}$. In this talk, we review many of the known Rosa-type labelings and the what is known for small graphs G. Then, we introduce a new kind of labeling for bipartite or tripartite graphs that addresses the cases $n \equiv m$ or $m+1 \pmod{2m}$. Participants will leave the talk with a recipe card for constructing the full spectrum of G-decompositions of K_n for certain bipartite or tripartite graphs G when m is a prime power.

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