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On K_4-ultrahomogeneous and $\{K_{2s}, T_{ts,t}\}_{K_2}$-homogeneous graphs based on ordered pencils of binary projective spaces

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Abstract

Let $\mathcal{C}$ be a class of graphs. A definition of $\mathcal{C}$-homogeneous graph G is given that fulfills the absence of a fitting generalization of $\mathcal{C}$-ultrahomogeneous graph by considering each induced subgraph of G in $\mathcal{C}$ anchored by means of an arc. Let $2 < r \in \mathbf{Z}$, $\sigma \in (0, r-1) \cap \mathbf{Z}$, $t = 2^{\sigma+1} - 1$ and $s = 2^{r-\sigma-1}$. A construction of non-line-graphical connected $\{K_{2s}, T_{ts,t}\}_{K_2}$-homogeneous graphs G (meaning $\mathcal{C} = \{K_{2s}, T_{ts,t}\}$ with each edge in G shared by exactly one copy of the complete subgraph K_{2s} and one copy of the Turán graph $T_{ts,t}$) is shown to yield an infinity of such graphs in terms of configurations of points and lines, one per pair (r, σ). Moreover, if $r - \sigma = 2$, then G is K_4-ultrahomogeneous with order $(2^r - 1)(2^r - 2)$ and number $4(2^{\sigma-1})$ of edge-disjoint copies of K_4 incident to each vertex.

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