

On decomposing complete tripartite graphs into 5-cycles

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The problem of finding necessary and sufficient conditions to decompose a complete tripartite graph $K(r, s, t)$ into 5-cycles was first considered by E.S. Mahmoodian and Maryam Mirzakhani (1995). They stated some necessary conditions and conjectured that these conditions are also sufficient. Since then, many cases of the problem have been solved by various authors; however the case when the partite sets $r \leq s \leq t$ have odd and distinct sizes remained open. We show the conjecture is true where r, s and t are all multiples of 5, $t + 45 \leq \frac{4rs}{r+s}$ and $t \neq s + 10$.

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