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On Wiener inverse interval problem of trees

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Abstract: The Wiener index $W(G)$ of a simple connected graph G is defined as the sum of distances over all pairs of vertices in a graph. We denote by $W[\mathcal{T}_n]$ the set of all values of the Wiener index for a graph from the class $\mathcal{T}_n$ of trees on n vertices. The largest interval of consecutive integers (consecutive even integers in case of odd n) contained in $W[\mathcal{T}_n]$ is denoted by $W^{int}[\mathcal{T}_n]$. In this paper we prove that both sets are of cardinality $\frac{1}{6}n^3 + O(n^{5/2})$ in the case of even n, while in the case of odd n we prove that the cardinality of both sets equals $\frac{1}{12}n^3 + O(n^{5/2})$, which essentially solves two conjectures posed in the literature.

Keywords: Wiener index, Wiener inverse interval problem, tree.

Math. Subj. Class.: 05C05, 05C90

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O Wienerjevem inverznem intervalskem problemu dreves

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Povzetek: Wienerjev indeks $W(G)$ enostavno povezanega grafa G je definiran kot vsota razdalj po vseh parih vozlišč v grafu. Označimo z $W[\mathcal{T}_n]$ množico vseh vrednosti Wienerjevega indeksa za graf iz razreda $\mathcal{T}_n$ dreves na n vozliščih. Največji interval zaporednih števil (zaporednih sodih števil v primeru lihega n) vsebovan v $W[\mathcal{T}_n]$ označimo z $W^{int}[\mathcal{T}_n]$. V tem članku dokažemo, da imata za sode n obe množici kardinalnost $\frac{1}{6}n^3 + O(n^{5/2})$, za lihe n pa $\frac{1}{12}n^3 + O(n^{5/2})$, kar v bistvu reši dve domnevi, zastavljeni v literaturi.

Ključne besede: Wienerjev indeks, Wienerjev inverzni intervalni problem, drevo.

Math. Subj. Class.: 05C05, 05C90

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