INVERSE PROBLEM ON THE STEINER WIENER INDEX

XUELIANG LI

Center for Combinatorics and LPMC-TJKLC
Nankai University, Tianjin 300071, China

e-mail: lxl@nankai.edu.cn

YAPING MAO

Department of Mathematics
Qinghai Normal University, Qinghai 810008, China

e-mail: maoyaping@ymail.com

AND

IVAN GUTMAN

Faculty of Science P.O. Box 60
34000 Kragujevac, Serbia, and
State University of Novi Pazar, Novi Pazar, Serbia

e-mail: gutman@kg.ac.rs

Abstract

The Wiener index $W(G)$ of a connected graph $G$, introduced by Wiener in 1947, is defined as $W(G) = \sum_{u,v \in V(G)} d_G(u,v)$, where $d_G(u,v)$ is the distance (the length a shortest path) between the vertices $u$ and $v$ in $G$. For $S \subseteq V(G)$, the Steiner distance $d(S)$ of the vertices of $S$, introduced by Chartrand et al. in 1989, is the minimum size of a connected subgraph of $G$ whose vertex set contains $S$. The $k$-th Steiner Wiener index $SW_k(G)$ of $G$ is defined as $SW_k(G) = \sum_{|S|=k} d(S)$. We investigate the following problem: Fixed a positive integer $k$, for what kind of positive integer $w$ does there exist a connected graph $G$ (or a tree $T$) of order $n \geq k$ such that $SW_k(G) = w$ (or $SW_k(T) = w$)? In this paper, we give some solutions to this problem.

Keywords: distance, Steiner distance, Wiener index, Steiner Wiener index.

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