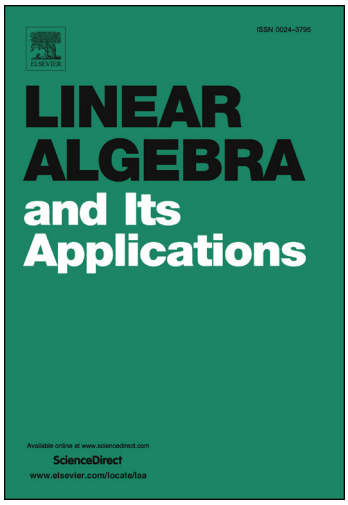

Complex unit gain bicyclic graphs with rank 2, 3 or 4

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Complex unit gain bicyclic graphs with rank 2, 3 or 4 ⋆

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Abstract

A $\mathbb{T}$-gain graph is a triple $\Phi = (G, \mathbb{T}, \varphi)$ consisting of a graph $G = (V, E)$, the circle group $\mathbb{T} = \{z \in C : |z| = 1\}$ and a gain function $\varphi : \overrightarrow{E} \to \mathbb{T}$ such that $\varphi(e_{ij}) = \varphi(e_{ji})^{-1} = \overline{\varphi(e_{ji})}$. The rank of $\mathbb{T}$-gain graph Φ, denoted by $r(\Phi)$, is the rank of the adjacency matrix of Φ. In 2015, Yu, Qu and Tu [G. H. Yu, H. Qu, J. H. Tu, Inertia of complex unit gain graphs, Appl. Math. Comput. 265(2015) 619–629] obtained some properties of inertia of a $\mathbb{T}$-gain graph. They characterized the $\mathbb{T}$-gain unicyclic graphs with small positive or negative index. Motivated by above, in this paper, we characterize the complex unit gain connected bicyclic graphs with rank 2, 3 or 4.

AMS classification: 05C50; 05C22

Key words: $\mathbb{T}$-gain graph; Rank; Bicyclic graph; Complex unit gain graph.

1 Introduction

All graphs considered in this article are simple graphs. Let $G = (V, E)$ be a simple graph with vertex set $V = V(G)$ and edge set $E = E(G)$. A *gain graph* is a graph whose edges are labeled orientably by elements of a group M. That is, if an edge e in one direction has label a group element m in M, then in the other direction it has label m^{-1} (the inverse element of m in M). We call the group M the *gain group*. A gain graph is a generalization of a signed graph, where the gain group M has only two elements 1 and -1, see Zaslavsky [10].

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