



SOME RESULT ABOUT RELATIVE NON-COMMUTING GRAPH

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Abstract

In this paper we define the relative non-commuting graph $\Gamma_{H,G}$ where G is a non-abelian group and H a subgroup of G . We obtain upper bounds for diameter and girth of this graph. We discuss about dominating set and planarity of $\Gamma_{H,G}$. Moreover, we explain a connection between $\Gamma_{H,G}$ and the commutativity degree of G . Furthermore, we prove that if (H_1, G_1) and (H_2, G_2) , are relative isoclinic then $\Gamma_{H_1, G_1} \cong \Gamma_{H_2, G_2}$ under special condition. consequent, we discuss about the energy of $\Gamma_{H,G}$ in some special cases. Finally we compute the number of spanning trees for some certain groups .

Keywords: non-commuting graph; non-abelian group; commutativity degree ;relative isoclinism

1 Introduction

Study of algebraic structures, by using the properties of graphs, becomes an exciting research topic in the last twenty years. This fact leading to many fascinating results and questions. There are many papers on assigning a graph to a ring or group and investigation of algebraic properties of ring or group using the associated graph, for instance see [1, 3]. A simple graph Γ_G is associated to a group G , whose vertex set is $G \setminus Z(G)$ and the edge set is all pairs (x, y) , where x and y are distinct non-central elements such that $[x, y] = x^{-1}y^{-1}xy \neq 1$. This graph the non-commuting graph of G and was introduced by Erdős and by asking whether there is a finite bound for the cardinalities of cliques in Γ_G , if Γ_G has no infinite clique. This problem was posed by Neumann in [8] and a positive answer was given to Erdős question. In the next section, after introducing the relative non-commuting graph $\Gamma_{H,G}$, we state some of basic graph theoretical properties of $\Gamma_{H,G}$ which are mostly new or a generalization of some results in [2],

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