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ORIGINAL PAPER

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On Finite p-Groups Whose Central Automorphisms Are All nth Class-Preserving

Rohit Garg[1]

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Abstract
Let G be a finite non-abelian p-group, where p is a prime. An automorphism α of G is called an nth class-preserving if for each $x \in G$, there exists an element $g_x \in \gamma_n(G)$ such that $\alpha(x) = g_x^{-1}xg_x$. An automorphism α of G is called a central automorphism if $x^{-1}\alpha(x) \in Z(G)$ for all $x \in G$. Let $\mathrm{Aut}_c^n(G)$ and $\mathrm{Autcent}(G)$, respectively, denote the group of all nth class-preserving and central automorphisms of G. We give necessary and sufficient conditions for a finite p-group G of class $n+1$ such that $\mathrm{Aut}_c^n(G) = \mathrm{Autcent}(G)$.

Keywords Central automorphism · nth class-preserving automorphism

Mathematics Subject Classification 20D45 · 20D15

1 Introduction

Let G be a finite p-group and let $Z(G)$ and $\Phi(G)$, respectively, denote the center and the Frattini subgroup of G. For a subgroup H of G, let x^H denote the subset $\{g^{-1}xg | g \in H\}$ of G. Notice that $x^H = x[x, H]$ and thus $|x^H| = |[x, H]|$ for all $x \in G$. We denote the subgroup $\langle x \in G | x^{p^i} = 1\rangle$ of G by $\Omega_i(G)$, where i is a positive integer.

An automorphism α of G is called central if $g^{-1}\alpha(g) \in Z(G)$ for all $g \in G$ and is called class-preserving if $\alpha(g) \in g^G$ for all $g \in G$. The set $\mathrm{Autcent}(G)$ of all central automorphisms of G and the set $\mathrm{Aut}_c(G)$ of all class-preserving automorphisms of G are normal subgroups of $\mathrm{Aut}(G)$, where $\mathrm{Aut}(G)$ denotes the group of all automorphisms of G. Yadav [4, Theorem A] gave necessary and sufficient conditions on a finite p-group G of class 2 such that $\mathrm{Aut}_c(G) = \mathrm{Autcent}(G)$. We call an automorphism α of G an nth class-preserving if for all $g \in G, \alpha(g) \in g^{\gamma_n(G)}$, where $\gamma_n(G)$ denotes the

✉ Rohit Garg
rohitgarg289@gmail.com

1 Department of Mathematics, Govt. Ripudaman College, Nabha 147 201, India

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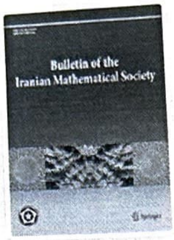

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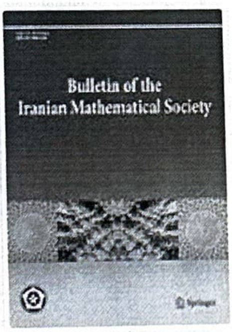

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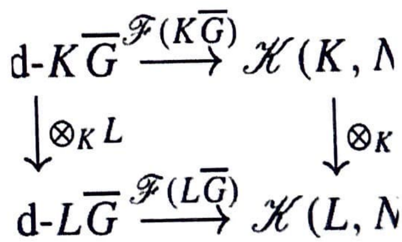

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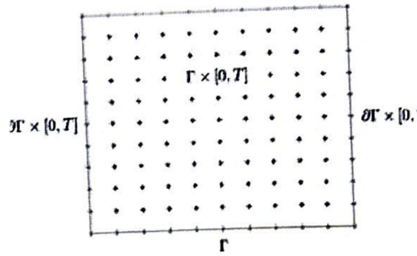

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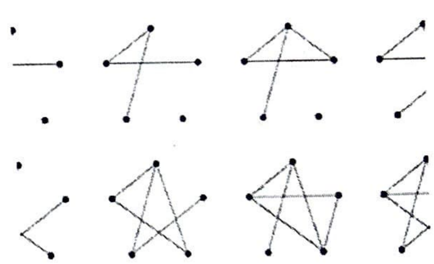

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