

TORSION UNITS IN INTEGRAL GROUP RINGS

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ABSTRACT. Let $G = \langle a \rangle \rtimes X$ where $\langle a \rangle$ is a cyclic group of order n , X is an abelian group of order m , and $(n, m) = 1$. We prove that if $\mathbb{Z}G$ is the integral group ring of G and H is a finite group of units of augmentation one of $\mathbb{Z}G$, then there exists a rational unit γ such that $H^\gamma \subseteq G$.

Let G be a finite group, $\mathbb{Z}G$ the integral group ring of G , and $U_1\mathbb{Z}G$ the group of units of augmentation one in $\mathbb{Z}G$. It has been conjectured by Zassenhaus that if H is a finite subgroup of $U_1\mathbb{Z}G$, then H is conjugate to a subgroup of G by a rational unit, i.e., there exists $\gamma \in U\mathbb{Q}G$ such that $H^\gamma \subseteq G$.

This conjecture has been confirmed by Weiss in [8] for p -groups. In this note we shall prove this conjecture for a certain class of metabelian groups. More precisely, we will establish the following result:

Theorem. *Let G be a split extension $\langle a \rangle \rtimes X$, where $\langle a \rangle$ is a cyclic group of order n , X is an abelian group of order m , and $(n, m) = 1$. If $H \subseteq U_1\mathbb{Z}G$ is a finite group, then there exists $\gamma \in U\mathbb{Q}G$ such that $H^\gamma \subseteq G$.*

Before proceeding to the proof of the theorem we record some useful facts that will be needed.

If N is a normal subgroup of G , let us denote by $\Delta(G, N)$ the kernel of the natural map $\mathbb{Z}G \rightarrow \mathbb{Z}(G/N)$. Also we briefly write $u \sim g$ to indicate that u is conjugate in $\mathbb{Q}G$ to g .

Lemma 1. *Let $G = A \rtimes X$, where A is an abelian normal p -group and X is any group with $(|A|, |X|) = 1$. Let $u \in U_1\mathbb{Z}G$ be a unit of the form $u = vw$, where $v \in U(1 + \Delta(G, A))$, $w \in U_1\mathbb{Z}X$. If u has finite order not divisible by p , then $u \sim w$.*

Proof. See [3, Lemma 2].

Lemma 2. *Let $G = \langle a \rangle \rtimes X$, where $o(a) = n$, $|X| = m$, and $(n, m) = 1$. If an element $a^i x$ of G , where $x \in X$, is of order divisible by all primes dividing n , then x is central in G .*

Proof. It is a consequence of [4, Lemma 2.3].

Lemma 3. *Let G be a split extension $\langle a \rangle \rtimes X$, where $\langle a \rangle$ is a cyclic group of order n , X is an abelian group of order m , and $(n, m) = 1$. If G_0 is a*

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Units In Integral Group Rings

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