

On Quasi-Left Primary and Quasi-Primary Γ -ideals in Γ -AG-Groupoids

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ABSTRACT— *The purpose of this paper is to introduce the notion of a quasi-primary ideals in Γ -AG-groupoids, we study quasi-primary and quasi-left primary ideals in Γ -AG-groupoids. Some characterizations of quasi-primary and quasi-left primary ideals are obtained. Moreover, we investigate the relationships between quasi-primary and quasi-left primary ideals in Γ -AG-groupoids. Finally, we obtain the necessary and sufficient conditions of a quasi-primary ideal to be a quasi-left primary ideal in Γ -AG-groupoids.*

Keywords— Γ -AG-groupoid, Γ -LA-semigroup, Γ -ideal, quasi-primary ideal, quasi-left primary ideal.

1. INTRODUCTION

Abel-Grassmann's groupoid (AG-groupoid) is a generalization of semigroup theory with wide range of usages in theory of flocks [6]. The fundamentals of this non-associative algebraic structure were first discovered by Kazim and Naseeruddin (1972). A groupoid S is called an AG-groupoid if it satisfies the left invertive law:

$$(ab)c = (cb)a$$

for all $a, b, c \in S$. It is interesting to note that an AG-groupoid with right identity becomes a commutative monoid [5]. This structure is closely related to a commutative semigroup. Because of containing a right identity, an AG-groupoid becomes a commutative monoid [5]. A left identity in an AG-groupoid is unique [5]. It lies between a groupoid and a commutative semigroup with wide range of applications in theory of flocks [6]. Ideals in AG-groupoids have been discussed in [4]. In 1981, the notion of Γ -semigroups was introduced by M. K. Sen. A groupoid S is called a Γ -AG-groupoid if it satisfies the left invertive law:

$$(a\gamma b)\delta c = (c\gamma b)\delta a$$

for all $a, b, c \in S$ and $\gamma, \delta \in \Gamma$ [3]. This structure is also known as a left almost semigroup (LA-semigroup). In this paper, we are going to investigate some interesting properties of recently discovered classes, namely Γ -AG-groupoid S always satisfies the Γ -medial law:

$$(a\gamma b)\beta(c\delta d) = (a\gamma c)\beta(b\delta d)$$

for all $a, b, c, d \in S$ and $\gamma, \beta, \delta \in \Gamma$ [3], while a Γ -AG-groupoid S with left identity e always satisfies Γ -paramedial law:

$$(a\gamma b)\beta(c\delta d) = (d\gamma c)\beta(b\delta a)$$