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Abstract

A nilpotent Leibniz algebra L is called extra special if $\dim(Z(L)) = \dim(L^2) = 1$. In this paper the structure, the second homology and the capability of extra special Leibniz algebras are completly determined.
Keywords: Leibniz algebras; Leibniz homology; extra special.
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1 Introduction

Throughout this paper, all Leibniz algebras are assumed to be finite-dimensional over an algebraically closed field $\mathbb{F}$ of characteristic different from 2.

Leibniz algebras were introduced by A.M. Bloh in [3, 4] as a non-skew symmetric generalization of Lie algebras. Approximately three decades later, Leibniz algebras were developed by C. Cuvier [9] and J-L. Loday [12, 13] in their cyclic homology investigations. Loday discovered that in the tensor powers version of Chevalley-Eilenberg complex of a Lie algebra the anti-symmetric property is ineffective and only the Leibniz property suffices. A left Leibniz algebra L over a field $\mathbb{F}$ is a vector space with a $\mathbb{F}$-bilinear mapping $[-,-] : L \times L \to L$ satisfying

$$[x,[y,z]] = [[x,y],z] + [y,[x,z]],$$

for all $x, y, z \in L$. This property means that for any $x \in L$ the left multiplication mapping by x, $l_x : L \to L$ is a derivation of L. Note that if the bilinear mapping $[-,-]$ on a Leibniz algebra L is skew-symmetric, then L is a Lie algebra.

As is well known, the classification of nilpotent Lie and consequently Leibniz algebras is an important problem. This paper is devoted to study nilpotent Leibniz algebras that the corresponding derived subalgebra and center have dimension one.