Inner and Outer Derivations of $\mathbb{F}V_{8n}$

Praveen Manju

Indian Institute of Technology Delhi, Hauz Khas, New Delhi-110016, India

Abstract

In this talk, we explicitly classify all inner and outer derivations of the group algebra $\mathbb{F}V_{8n}$, where $\mathbb{F}$ is a field of characteristic 0 or an odd prime p and V_{8n} is a group of order $8n$ with presentation $\langle a, b \mid a^{2n} = b^4 = 1, ba = a^{-1}b^{-1}, b^{-1}a = a^{-1}b \rangle$. First, we give an explicit classification of all $\mathbb{F}$-derivations of $\mathbb{F}V_{8n}$ by giving the dimension and a basis of the $\mathbb{F}$-derivation algebra $\mathrm{Der}_{\mathbb{F}}(\mathbb{F}V_{8n})$ consisting of all $\mathbb{F}$-derivations of $\mathbb{F}V_{8n}$. Then we explicitly classify all inner and outer derivations of $\mathbb{F}V_{8n}$ when $\mathbb{F}$ is an algebraic extension of a prime field. As a consequence, it is obtained that all derivations of $\mathbb{F}V_{8n}$ are inner when the characteristic of $\mathbb{F}$ is 0 or p with $\gcd(n, p) = 1$, and non-zero outer derivations exist only when the characteristic of $\mathbb{F}$ is p with $\gcd(n, p) \neq 1$.

Keywords

Derivation, Inner derivation, Outer derivation, $\mathbb{F}$-derivation, Group algebra.