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Polynomial Modules over a Class of GIM Lie Algebras

We construct and classify all rank one polynomial modules over the GIM Lie algebra $\mathfrak{g}_n$ $(n \geq 3)$ with structural matrix

$$\begin{bmatrix} 2 & -1 & & & 1 \\ -1 & 2 & -1 & & \\ & \ddots & \ddots & \ddots & \\ & & -1 & 2 & -1 \\ 1 & & & -1 & 2 \end{bmatrix}_{n\times n}.$$

Moreover, the simplicity of these modules is studied.

Keywords: Lie algebra, Cartan subalgebra, polynomial module, non-weight module.

MSC: 17B10, 17B65, 17B67.