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J-Armendariz Rings Relative to a Monoid

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Abstract

For a monoid M, we introduce J-M-Armendariz rings, which is a common generalization of J-Armendariz and weak M-Armendariz rings, and investigate their properties. We show that every NI-ring is J-M-Armendariz, for any unique product monoid M. Also, we provide various examples and classify how the J-M-Armendariz rings behave under various ring extensions. It is shown that if R is semicommutative ring and M-Armendariz then R is J-(M×N)-Armendariz, where N is a unique product monoid.

Keywords: J-M-Armendariz ring; Semicommutative ring; Jacobson radical; u.p.-monoid.

Mathematics Subject Classification [2010]: 16N20, 16N40.

1 Introduction

Throughout this paper every ring is an associative ring with identity unless otherwise stated. For a ring R, we denote by $nil(R)$ the set of all nilpotent elements of R and by $J(R)$ the Jacobson radical of R. The n-by-n full (resp. upper triagular) matrix ring over R is denoted by $Mat_n(R)$ (resp. $T_n(R)$), and E_{ij}'s denote the matrix units. $\mathbb{Z}$ and $\mathbb{C}$ denote the ring of integers and the field of complex numbers. The polynomial ring with an indeterminate x over R is denoted by $R[x]$. A ring R is said to be Armendariz if the product of two polynomials in $R[x]$ is zero if and only if the product of their coefficients is zero. This definition was coined by Rege and Chhawchharia in [1] in recognition of Armendariz' s proof in [2] that reduced rings (i.e., rings without nonzero nilpotent elements) satisfy this condition. Recently, several types of generalizations of Armendariz rings have been introduced (see, e.g., [3, 4, 5]). Liu and Zhao [4], studied the structure of the set of nilpotent elements in Armendariz rings and introduced weak Armendariz rings as a generalization. A ring R is said to be weak Armendariz ring if the product of two polynomials in $R[x]$ is zero, then the product of their coefficients is nilpotent. C. Zhang and J. Chen [5], studied a generalization of weak Armendariz rings, which is called weak M-Armendariz rings. A ring is called weak M-Armendariz (weak Armendariz relative to M) if whenever $\alpha = a_1g_1 + \cdots + a_ng_n, \beta = b_1h_1 + \cdots + b_mh_m \in R[M]$, with $g_i, h_j \in M$

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