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ON COMMUTATIVITY OF RINGS WITH CONSTRAINTS ON SUBSETS

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Abstract

Let R be a ring with center $Z(R)$, and $A(R)$ be an appropriate subset of R. In this paper, it is shown that R is commutative if and only if for every $x, y \in R$, there exist integers $k = k(x, y) \geq 0, m = m(x, y) > 1$ and $n = n(x, y) \geq 0$ such that $[x, x^n y + y^m x^k] = 0$ and for each $x \in R$ either $x \in Z(R)$ or there exists a polynomial $f(t)$ in $Z[t]$ such that $x - x^2 f(x) \in A(R)$, where $A(R)$ is a nil commutative subset of R. If R is a left or right s-unital ring, then the following are equivalent: (i) R is commutative. (ii) For every $x, y \in R$ there exist integers $k = k(x, y) \geq 0, m = m(x, y) > 1$ and $n = n(x, y) \geq 0$ such that $[x, x^n y + y^m x^k] = 0$ and for each $x \in R$ either $x \in Z(R)$ or there exists a polynomial $f(t)$ in $Z[t]$ such that $x - x^2 f(x) \in A(R)$, where $A(R)$ is a nil subset of R. (iii) For each $y \in R$, there exists an integer $m = m(y) > 1$ such that $[x, x^n y + y^m x^k] = 0 = [x, x^n y^m + y^{m^2} x^k]$ for all $x \in R$, where $k \geq 0, n \neq 1$ is fixed non-negative integers.

Key Words and Phrases : *Commutativity of rings, s-unital rings, Polynomial.*

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