

In this dissertation we deal with constructive methods applied to the commutative semirings and commutative radical rings. In Chapter 2 we study the class  $S$  of the commutative subdirectly irreducible radical rings. We present a few constructive methods for them and using the reflection of the category of the commutative rings into the category of the commutative radical rings we derive a lot of examples of rings in  $S$  with various properties. We prove that a ring  $S \cong S$  is noetherian if and only if it is finite. We show partial results in the classification of factors of  $S$  modulo monoliths.

In Chapter 3 we introduce, using the  $p$ -prime valuation for all primes  $p$ , a set of characteristic sequences that can be assign to every subsemiring of  $\mathbb{Q}^+$ . We find and classify all maximal subsemirings of positive rational numbers and show that every proper subsemiring of  $\mathbb{Q}^+$  is contained in at least one of them. This results was published in [16].

In Chapter 4 we construct, using the approach from the Chapter 4, a new large subclass of the class  $\text{CongSimp}$  of all proper congruence-simple subsemirings of  $\mathbb{Q}^+$ , classify all the maximal elements of  $\text{CongSimp}$  and show that every element of  $\text{CongSimp}$  is contained in at least one of them.

In Chapter 5 we find an equivalent condition under which is the semiring  $\mathbb{Q}^+[\alpha] \subseteq \mathbb{C}$ ,  $\alpha \in \mathbb{C}$ , contained in a parasemifield of  $\mathbb{C}$  and make a classification for the case when  $\alpha$  is algebraic of degree 2. This results is published in [18].