Stellingen

behorende bij het proefschrift
Algorithms for finite rings
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1. There exists a deterministic polynomial-time algorithm that, given a finite ring R and two finite R-modules M and N, determines if they are isomorphic, and if they are, exhibits an isomorphism.

2. There exists a deterministic polynomial-time algorithm that, given a finite ring R and a finite R-module M, computes a set of generators for M of minimum cardinality.

3. There exists a deterministic polynomial-time algorithm that, given a finite ring R and two finite R-modules M and N, computes a maximum length R-module C that is isomorphic to a direct summand both of M and of N. Moreover, the algorithm computes direct complements of C both in M and in N, together with the corresponding isomorphisms.

4. There exist deterministic polynomial-time algorithms that, given a finite ring R and a finite R-module M, construct a projective cover and an injective hull of M.

5. There exists a deterministic polynomial-time algorithm that, given a finite ring R and two finite R-modules M and N, one of which is R-projective, constructively tests for existence of a surjective R-module homomorphism $M \to N$.

6. The problem of testing for existence of an injective module homomorphism between two finite modules over a finite ring, where one of the modules is projective, is NP-complete.

7. There exists a deterministic polynomial-time algorithm that, given a finite ring R, computes a two-sided nilpotent ideal $\mathfrak{j}_R$ of R such that $R/\mathfrak{j}_R$ is a separable projective algebra over its prime subring k (i.e. it is separable as a k-algebra and projective as a k-module). The family of ideals produced by this algorithm is functorial under isomorphisms, i.e. if $\phi : R \to S$ is an isomorphism of finite rings, then $\phi(\mathfrak{j}_R) = \mathfrak{j}_S$.

8. There exists a deterministic polynomial-time algorithm that, given a finite ring R, computes a subring $\mathcal{P}_R$ such that R is separable over $\mathbb{Z}$ if and only if R is a separable projective $\mathcal{P}_R$-algebra.