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## Non-Replicable Function-Based Multi-Level Random Dynamic Secret Key Algorithm (Extended Version)

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### Abstract

Based on the proof that, as an encryption function, the residual function  $y=(ax)\bmod m$  is a non-replicable function, this paper constructs multi-level encryption functions  $y^1=(a^1x)\bmod m_1, \dots, y_n=(a_n y_{n-1})\bmod m_n$ . And based on this the paper constructs the multi-level random dynamic secret key algorithm  $XM^{-1}$ .  $XM^{-1}$  has three-fold safeguards. First, the encryption function is not replicable. Secondly, the secret keys and the number of secret keys are randomized. Thirdly, when the system does not run, there is no secret key. After slight changes, the four examples for constructing  $XM^{-1}$  given in this paper can be put into practical use.

**Keywords:** Residual Function, Not Replicable Function, Multi-Level Encryption Function,  $XM^{-1}$