University of Michigan–Ann Arbor

Department of Electrical Engineering and Computer Science

EECS 475 **Introduction to Cryptography**, Winter 2023

Lecture 24: Digital Signatures, Modeling Digital Signatures, RSA Signatures

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1 Continue on Better RSA Encryption Approach

Apply $RSA_{N,e}$ on a random $x \leftarrow \mathbf{Z}_N^*$. Then, we know x is hard to recover from $y = RSA_{N,e}(x)$. We first use a hash function on x and encrypt message m:

$$c = (y = RSA_{N,e}(x) = x^e \bmod N, H(x) \oplus m)$$

$Dec(sk = (N, d), c = (y, p))$: Compute $x = RSA_{N,d}(y) = y^d \bmod N$ and output $H(x) \oplus p$
Note: Because x is unknown, $H(x)$ would be close to completely unknown.

We need to check the correctness and security requirement of RSA:

- Correctness
- CPA-Security

2 Digital Signature

3 Modeling Digital Signature

4 RSA Signature