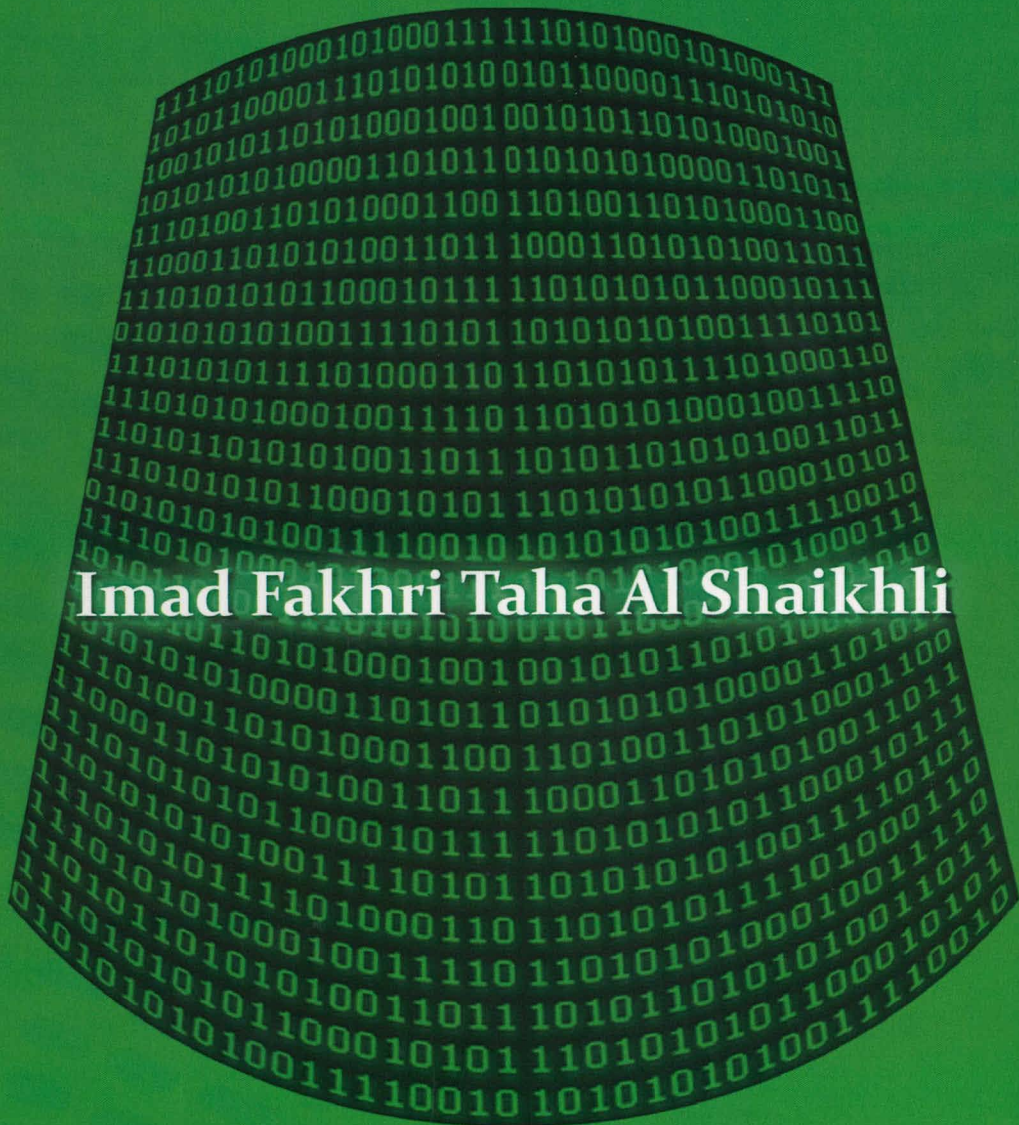


Cryptography

Past, Present and Future



Imad Fakhri Taha Al Shaikhli

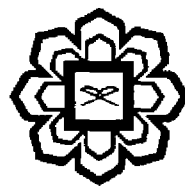


IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

Cryptography: Past, Present and Future

Imad Fakhri Taha Al Shaikhli



IIUM Press

Published by:

IUM Press

International Islamic University Malaysia

First Edition, 2011

©IUM Press, IUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Imad Fakhri Taha Al-Shaikhli
Cryptography: Past, Present and Future
Imad Fakhri Taha Al-Shaikhli

ISBN: 978-967-418-091-1

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :

IUM PRINTING SDN. BHD.

No. 1, Jalan Industri Batu Caves 1/3

Taman Perindustrian Batu Caves

Batu Caves Centre Point

68100 Batu Caves

Selangor Darul Ehsan

TABLE OF CONTENTS

Dedication	I
Preface	Vii
Acknowledgement	Viii
PART I Classical Cryptography	1
Chapter One Introduction	3-9
- Imad Fakhri Taha Al Shaikhli	
- Rusydi Hasan	
- Nurhidayah Binti Abdulrashid	
- Faizurimawaty Bt Padzilah	
- Nabilah Bt Abd Rahman	
Chapter Two Monoalphabetic Substitution Cipher	11-16
- Imad Fakhri Taha Al Shaikhli	
- Rusydi Hasan	
- Nurhidayah Binti Abdulrashid	
- Faizurimawaty Bt Padzilah	
- Nabilah Bt Abd Rahman	
Chapter Three Polyalphabetic Substitution Cipher	17-23
- Imad Fakhri Taha Al Shaikhli	
- Rusydi Hasan	
- Nurhidayah Binti Abdulrashid	
- Faizurimawaty Bt Padzilah	
- Nabilah Bt Abd Rahman	
Chapter Four Machine-Based Cryptography	25-30
- Rusydi Hasan	
- Imad Fakhri Taha Al Shaikhli	
- Nurhidayah Binti Abdulrashid	
- Faizurimawaty Bt Padzilah	
- Nabilah Bt Abd Rahman	
PART II Modern Symmetric-Key Cryptography	31
Chapter Five Block and Stream Cipher	33-38
- Sufyan Salim Mahmood Al Dabbagh	
- Imad Fakhri Taha Al Shaikhli	
- Muhammad Fadil Lubis	
- Usman bin Mohd Azhar	
- Nopan Ziro Ando	
Chapter Six Data Encryption Standard (DES)	39-46
- Imad Fakhri Taha Al Shaikhli	

- Sufyan Salim Mahmood Al Dabbagh	
- Muhammad Fadil Lubis	
- Usman bin Mohd Azhar	
- Nopan Ziro Ando	
Chapter Seven Advanced Encryption Standard(Rijndael)	47-52
- Sufyan Salim Mahmood Al Dabbagh	
- Imad Fakhri Taha Al Shaikhli	
- Muhammad Fadil Lubis	
- Usman bin Mohd Azhar	
- Nopan Ziro Ando	
Chapter Eight Trivium and Rabbit Stream Cipher	53-61
- Imad Fakhri Taha Al Shaikhli,	
- Sufyan Salim Mahmood Al Dabbagh	
- Muhammad Fadil Lubis	
- Usman bin Mohd Azhar	
- Nopan Ziro Ando	
PART III Hash Functions	63
Chapter Nine Introduction	65-72
- Khanssaa Munthir Abdulmajed	
- Imad Fakhri Taha Al Shaikhli	
- Sufyan Salim Mahmood Al Dabbagh	
- Ahmad Faridi Abdul Matin	
- Sibomana Hilali Hussein	
Chapter Ten Message Digest (MDX) Family	73-80
- Imad Fakhri Taha Al Shaikhli	
- Sufyan Salim Mahmood Al Dabbagh	
- Khanssaa Munthir Abdulmajed	
- Ahmad Faridi Abdul Matin	
- Sibomana Hilali Hussein	
Chapter Eleven SHA family hash function	81-87
- Khanssaa Munthir Abdulmajed	
- Imad Fakhri Taha Al Shaikhli	
- Sufyan Salim Mahmood Al Dabbagh	
- Ahmad Faridi Abdul Matin	
- Sibomana Hilali Hussein	
Chapter Twelve RIPEMD and Chameleon Hash Function	89-96
- Sufyan Salim Mahmood Al Dabbagh	
- Imad Fakhri Taha Al Shaikhli	
- Khanssaa Munthir Abdulmajed	
- Ahmad Faridi Abdul Matin	

- Sibomana Hilali Hussein

PARTIV Public Key & Digital Signature Schemes	97
Chapter Thirteen Rivest-Shamir-Adleman (RSA)	99-105
<ul style="list-style-type: none"> - Iqram Mohammed Hayek - Imad Fakhri Taha Al Shaikhli - Sufyan Salim Mahmood Al Dabbagh - Kusai Abu Hilal 	
Chapter Fourteen Cryptanalysis of RSA	107-112
<ul style="list-style-type: none"> - Imad Fakhri Taha Al Shaikhli - Sufyan Salim Mahmood Al Dabbagh - Iqram Mohammed Hayek - Kusai Abu Hilal 	
Chapter Fifteen Digital Signature Algorithm	113-115
<ul style="list-style-type: none"> - Sufyan Salim Mahmood Al Dabbagh - Imad Fakhri Taha Al Shaikhli - Iqram Mohammed Hayek - Kusai Abu Hilal 	
Part V Zero-Knowledge Proof	116
Chapter Sixteen Background of Zero-Knowledge Proof	117-120
<ul style="list-style-type: none"> - Imad Fakhri Taha Al Shaikhli - Rusydi Hasan - Siti Khairunnisa Mohd Bakri - Nur Dalilah Bt More Yusoff - Nur Khairunnisa Bt Juara 	
Chapter Seventeen Interactive Proof Systems	121-126
<ul style="list-style-type: none"> - Rusydi Hasan - Imad Fakhri Taha Al Shaikhli - Siti Khairunnisa Mohd Bakri - Nur Dalilah Bt More Yusoff - Nur Khairunnisa Bt Juara 	
Chapter Eighteen Zero-Knowledge Proof	127-132
<ul style="list-style-type: none"> - Imad Fakhri Taha Al Shaikhli - Rusydi Hasan 	

- Siti Khairunnisa Mohd Bakri	
- Nur Dalilah Bt More Yusoff	
- Nur Khairunnisa Bt Juara	
Chapter Nineteen Feige-Fiat-Shamir Identification Scheme	133-138
- Rusydi Hasan	
- Imad Fakhri Taha Al Shaikhli	
- Siti Khairunnisa Mohd Bakri	
- Nur Dalilah Bt More Yusoff	
- Nur Khairunnisa Bt Juara	
Part VI Secret Sharing	139
Chapter Twenty Introduction	141-146
- Muhammad Israfil	
- Imad Fakhri Taha Al Shaikhli	
- Sufyan Salim Mahmood Al Dabbagh	
Chapter Twenty One Shamir's Threshold Scheme	147-150
- Imad Fakhri Taha Al Shaikhli	
- Sufyan Salim Mahmood Al Dabbagh	
- Muhammad Israfil	
Chapter Twenty Two Blakely's Secret Sharing Scheme	151-155
- Sufyan Salim Mahmood Al Dabbagh	
- Imad Fakhri Taha Al Shaikhli	
- Muhammad Israfil	
Part VII Quantum Cryptography	156
Chapter Twenty Three Quantum Cryptography	
- Azeddine Messikh	

13. Rivest-Shamir-Adleman (RSA)

- Iqram Mohammed Hayek
- Imad Fakhri Taha Al Shaikhli
- Sufyan Salim Mahmood Al Dabbagh
- Kusai Abu Hilal

ABSTRACT

In this article we will talk about the background and description of Rivest-Shamir-Adleman (RSA). Also we will introduce into key generation algorithm for RSA, encryption algorithm for RSA, decryption of RSA and Signing. Also, we will describe how this algorithm works and we will give example.

BACKGROUND

In 1978 R.L. Rivest, A. Shamir and L. Adleman proposed a public key cryptosystem that has become known as the RSA system where “RSA” are the initials of the three creators: “Rivest, Shamir, and Adleman”. It's based on the following idea:

It is very simply to multiply numbers together, especially with computers. But it can be very difficult to factor numbers. For example, if I ask you to multiply together 34537 and 99991, it is a simple matter to punch those numbers into a calculator and get 3453389167. But the reverse problem is much harder. (Stallings, 2005)

Suppose I give you the number 1459160519. I'll even tell you that I got it by multiplying together two integers. Can you tell me what they are? This is a very difficult problem. A computer can factor that number fairly quickly, but (although there are some tricks) it basically does it by trying most of the possible combinations It is, however, not too hard to check to see if