Q1 Solve any two.

a) Explain with example different approaches to implement security model. 5

1. No Security
2. Security Through obscurity
3. Host security
4. Network Security

b) Encrypt the message 'Come Home Tomorrow' using 5

i. Ceaser Cipher

ii. Simple Columnar Transposition Techniques with four columns. Order is 3,2,4,1

i. frph krph wrpruurz

ii. mmmooooreeowCHTr

c) Explain how attackers misuse cookies to collect important information. 5

1. An advertising agency (My Ads) contacts major Web sites and places banner adds for its corporate clients' products on their pages. It pays some fees to the site owners for this.
2. Instead of providing an actual image that can be embedded by the respective website in their pages directly, it provides a link (URL) to add each page.
3. Each URL contains a unique number in the file part.
4. When a user visits a page for the first time, the browser fetches the advertisement image from My Ads along with the main HTML page for the site it is visiting.
5. When the user vists the main site, My Ads sends a cookie to the browswer containing a unique user id and records the relationship between this user id and the file name.
6. Latter, when the same user visits another page, the browser sees another reference to My Ads.
7. The browser sends the previous cookie to My Ads and also fetches the current page from My Ads as before.
8. My Ads knows that the same user has visited another webpage now.
9. It adds this reference to its database.

d) List possibilities of attacks when the sender of message encrypts the plain text message into its corresponding cipher text. 5

1. Cipher text only attack
2. Known plain text attack
3. Chosen plain text attack
4. Chosen cipher text attack
5. Chosen text attack

Q2 Solve any two.

a) List different cryptography algorithm types. Explain with example. 5

Stream cipher

Block cipher

b) Explain the steps in various rounds of AES. 5

Apply S-box to each plain text

Rotate Row k of the plain text block (i.e. state) by k bytes

Perform a mix column operation

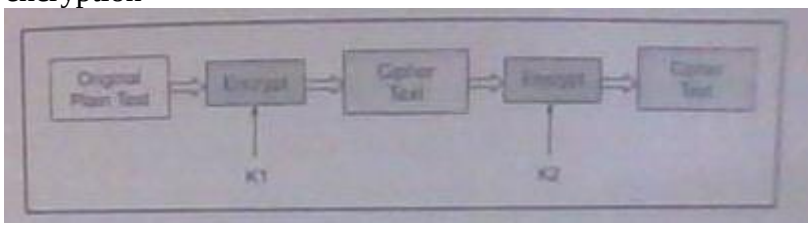
XOR the state with key block

c) Explain subkey generation process of blowfish algorithm. 5

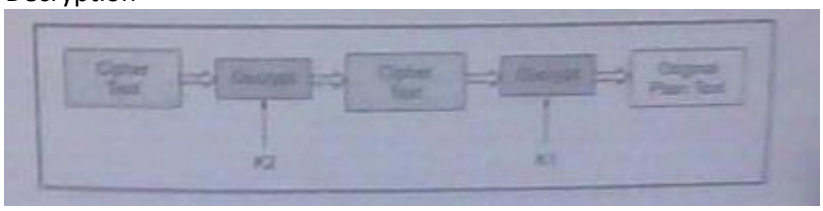
There are
32 bit keys geneerated as K1, K2,.....Kn
32 bit 18 P-arrays
Four S-boxes each containing 256 32 bit entries
S1,0, S1,1, ...S1,255
S2,0, S2,1, ...S2,255
S3,0, S3,1, ...S3,255
S4,0, S4,1, ...S4,255
Sub key generation
1.initialize P-array
2. Do bitwise XOR of P! with K1, P2 with K2 until P18. Thia works until P14 and K14. For P15 to P18 reuse K1 to K4
P1= P1 XOR K1
P2 = P2XOR K2
P3 = P3XOR K3
P4 = P4 XOR K4
.
.
.
P14 = P14 XOR K14
P15 = P15 XOR K1
P16= P16 XOR K2
P17 = P17XOR K3
P18 = P18 XOR K4
Take a 64 bit block with all 64 bits initialized to 0. Use the above P-array and S-boxes above to run the Blowfish encryption process.

d) Explain double DES algorithm. 5

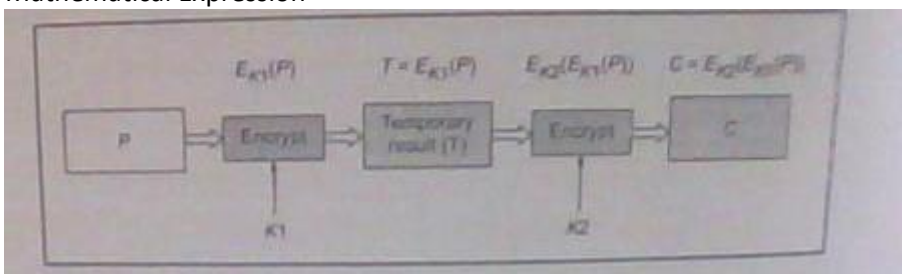
encryption



Decryption



Mathematical Expression



Q3 Solve any two.

a) Explain how RSA is used for performing digital signature. 5

Assume A wants to send a message M to B along with the digital signature S calculated over message M.

Step 1. The sender (A) uses the SHA-1 mesaage digest algorithm to calculate the message digest (MD1) over the original message (M).

Step 2. The sender (A) now encrypts the message digets with her private kay. The output of this process is called as the digital signature (DS).

Step 3. Now the sender (A) sends the original message (M) along with the digital signature (DS) to the receiver (B).

Step 4. After the receiver (B) receives the original message (M) and the sender (A's) digital signature, B use the same message digest algorithm as was used by the a and calculate its own message digest (MD2)

Step 5. The receiver (B) now uses the sender's (A's) public key to decrypt the digital signature.

Step 6. B now compare two message digests MD1 and MD2.

If MD1 = MD2

B accepts the original message (M) as the correct, unaltered message from A

B is also assured that the message came from A and not from someone posing as A.

Step 2.

b) Explain how secure hash algorithm -512 works. 5

Steps

Padding

Append length

Divide the input into 1024 bit blocks

Initialize chaining variables

Process blocks

c) Explain the working of HMAC. 5

Let

MD = message digest

M = input messgae

L =number of blocks in the message

b = number of bits in each blocks

K = shared symmetric key

ipad = A string 00110110 repeated b/8 times

opad = A string 01011010 repeated b/8 times

Steps

1. Make the length K = b
2. XOR K with ipad to produce S1
3. Append M to S1
4. Message Digest algorithm
5. XOR K with opad to produce S2
6. Append H to S2
7. Message Digest algorithm

d) Explain Elipitic Curve Cryptography and EIGamal. 5

Introduction
Difference between RSA and ECC
Explanation of Elliptic curve

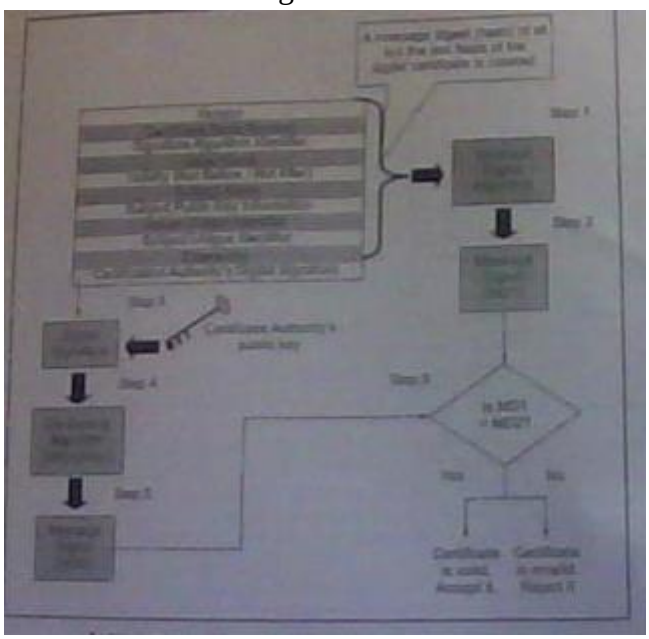
Q4 Solve any two.

a) Describe of the various fields of x.509V3 digital certificate 5

various fields of x.509V3 digital certificate are:
Authority Key Identifier
Subject Key Identifier
Key usage
Extended Key usage
Private Key usage Period
Certificate Policies
Policy Mappings
Subject Alternative Name
Issuer Alternative Name
Subject Directory Attributes
Basic Constraints
Name Constraints
Policy Constraints

b) How digital certificate is verified? 5

The verification of digital certificate consist of following steps:



c) Why do we trust digital certificate. 5

d) List and explain public key cryptography standards. 5

Explanation of any five of the following public key cryptography standards:
PKCS#1 RSA Encryption Standard
PKCS#2 RSA Encryption Standard for Message Digest
PKCS#3 Diffie-Hellman Key Agreement Standard
PKCS#5 Password Based Encryption
PKCS#6 Extended Certificate Syntax Standard
PKCS#7 Cryptographic Message Syntax Standard
PKCS#8 Private Key Information Standard
PKCS#9 Selected Attribute Types
PKCS#10 Certificate Request Syntax Standard
PKCS#11 Cryptographic Token Interface Standard
PKCS#12 Personal Information Exchange Syntax Standard
PKCS#13 Elliptic Curve Cryptography Standard
PKCS#14 Pseudo-Random Number Generation Standard
PKCS#15 Cryptographic token Information Syntax

Q5 Solve any two.

a) Explain handshake protocol. 5

The Handshake protocol is the first sub protocol used by the client and the server to communicate using an SSL-enabled connection.
Format of handshake protocol.
Phase 1 : Establish Security Capabilities
Phase 2 :Server authentication and key exchange
Phase 3 : Client authentication and key exchange
Phase 4 :Finish

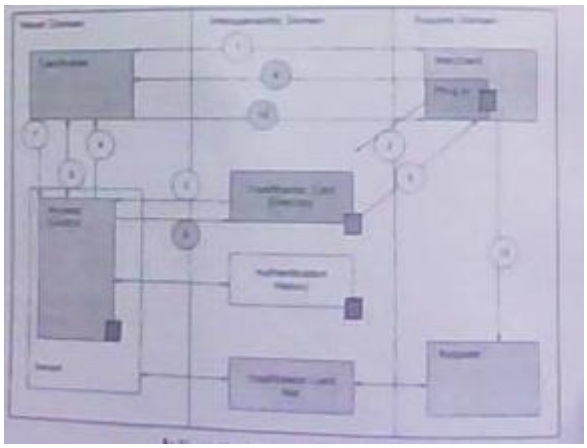
b) Explain the Secure Electronic Transaction process. 5

SET Process

1. The customer opens an account
2. The customer receives a certificate
3. The merchant receives a certificate
4. The customer places an order
5. The merchant is verified
6. The order and payment detail are sent
7. The merchant requests payment authorization
8. The payment gateway authorizes the payment
9. The merchant confirms the order
10. The merchant provides goods or services
11. The merchant requests payment

c) With neat diagram write internal operations of 3-D secure protocol. 5

Explanation



d) List different firewall configurations. Explain any two. 5

Different firewall configurations are

1. Screened Host Firewall, Single Homed Bastion
2. Screened Host Firewall, Dual Homed Bastion
3. Screened Subnet Firewall

Explanation of any two.

Q6 Solve any two.

a) Explain how clear text password works. What are the problems with it? 5

Every user in a system is assigned with a user id and an initial password which is alterable by the user. The password is stored in the user database against the user id on the server. The authentication mechanism works as

1. Prompt for user id and password
2. User enters user id and password
3. user id and password validation
4. Authentication result
5. Inform user accordingly.

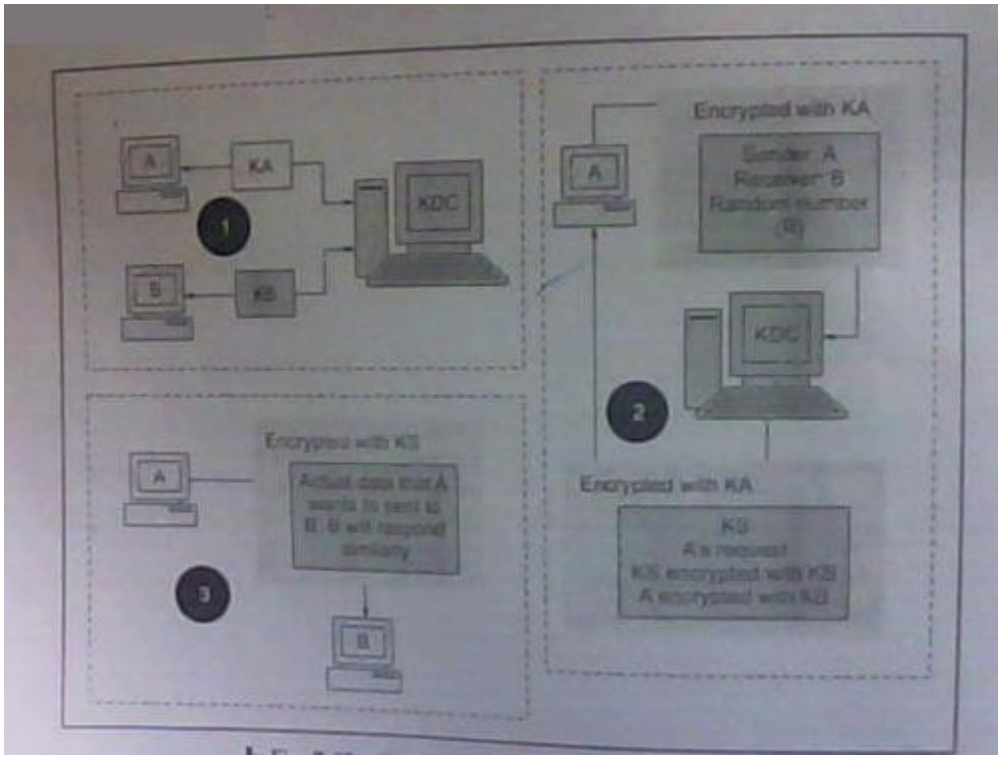
Problems:

1. Database contains passwords in clear text
2. Password travels in clear text from the user's computer to the server.

b) Write a short note on key distribution center. 4

KDC is central authority dealing with keys for individual computers in computer network. It is similar to the concept of the Authentication Server (AS) and Ticket Granting Server in Kerberos. Every node store unique secrete key with the KDC. Whenever user A wants to communicate securely with user B the following happens:

1. The background is that A has a shared secrete key KA with KDC. Similarly B is assume to share a secrete key KB with the KDC.
2. A sends request to KDC encrypted with KA which includes
   a. Identities of A and B.
   b. A random number R called nonce.
3. KDC responds with message encrypted with KA, containing
   a. One-time symmetric key KS
   b. Original request that was sent by A, for verification.
   c. KS encrypted with KB and id of A encrypted with KB.
4. A and B now communicate by using KS for encryption



1

c) Explain how challenge/response tokens works. 5

1. User sends a login request
2. Server creates random challenge
3. User signs the random challenge with the message digest for the password.
4. Server verifies the encrypted random challenge received from the user.
5. Server returns on an appropriate message back to the user.

d) What are the One-way authentication approaches? Explain any two. 5

Listing

Explanation

1. Login Only
2. Shared Secrete
3. One-way public key

Q7 Solve any three.

a) Write short note on phishing. 5

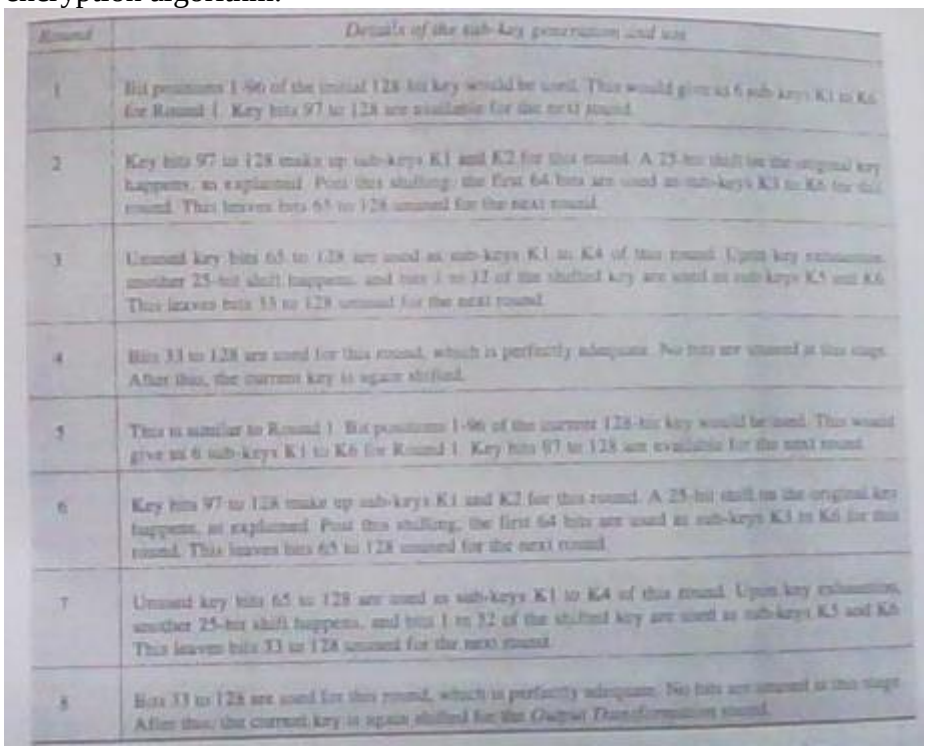
Attacker set up a fake web sites, which look like the real website.

The attacker modus operandi works as follows:

1. The attacker decides to create his/her own web site, which looks very identical to a real website.
2. The attacker can use many technique to attack the bank's customer.
3. When the customer clicks on the URL specified in the email (received from attacker) , he/she is taken to the attacker's site and not the original site. There the customer is prompted to enter confidential information . the attacker accepts this information and display thank you message. The attacker now uses the confidential information .

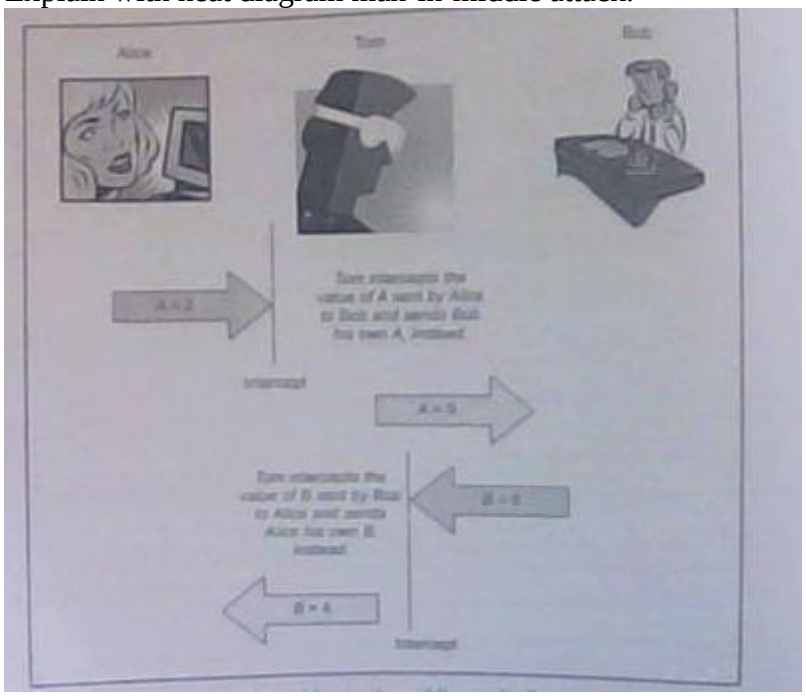
b) Explain subkey generation process of each round of international data 5

encryption algorithm.



Round	Details of the sub-key generation and use
1	Bit positions 1-96 of the initial 128 bit key would be used. This would give us 6 sub-keys K1 to K6 for Round 1. Key bits 97 to 128 are available for the next round.
2	Key bits 97 to 128 make up sub-keys K1 and K2 for this round. A 25-bit shift on the original key happens, as explained. Post this shifting, the first 64 bits are used as sub-keys K3 to K8 for this round. This leaves bits 65 to 128 unused for the next round.
3	Unused key bits 65 to 128 are used as sub-keys K1 to K4 of this round. Upon key exhaustion, another 25-bit shift happens, and bits 1 to 32 of the shifted key are used as sub-keys K5 and K6. This leaves bits 33 to 128 unused for the next round.
4	Bits 33 to 128 are used for this round, which is perfectly adequate. No bits are unused at this stage. After this, the current key is again shifted.
5	This is similar to Round 1. Bit positions 1-96 of the current 128-bit key would be used. This would give us 6 sub-keys K1 to K6 for Round 1. Key bits 97 to 128 are available for the next round.
6	Key bits 97 to 128 make up sub-keys K1 and K2 for this round. A 25-bit shift on the original key happens, as explained. Post this shifting, the first 64 bits are used as sub-keys K3 to K8 for this round. This leaves bits 65 to 128 unused for the next round.
7	Unused key bits 65 to 128 are used as sub-keys K1 to K4 of this round. Upon key exhaustion, another 25-bit shift happens, and bits 1 to 32 of the shifted key are used as sub-keys K5 and K6. This leaves bits 33 to 128 unused for the next round.
8	Bits 33 to 128 are used for this round, which is perfectly adequate. No bits are unused at this stage. After this, the current key is again shifted for the *Output Transformation* round.

c) Explain with neat diagram man-in-middle attack. 5



d) Why is a self-signed certificate needed? 5

The certificate authority hierarchy begins with the root CA. The root CA has one or more second level CAs below. Each of these second level CAs can have one or more third level CAs, which in turn have lower level CAs and so on. This hierarchy relieves the root CA from having to manage all the possible digital certificates. Instead the root CA can delegate this job to the second level CA. Each od this second level CA could appoint third level CA and so on.

In this there may be problem of the verification of root CA .

As the root CA is the last in the validation chain, there is no way to validate it's certificate. The root CA and many times, even the second or third level

CAs are automatically considered as trusted CAs. These CAs certificate is a self signed certificate ie the root CA signs its own certificate.

e) Explain how pretty good privacy works. 5

1. Digital signature
2. Compression
3. Encryption
4. Digital enveloping
5. Base-64 Encoding

f) How does certificate-based authentication works? 5

1. Creation, Storage and distribution of digital certificate
2. Login request
3. Server creates a random challenge
4. User signs the random challenge
5. Server returns an appropriate message back to the user.