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4020 - A

Information Security

Assignment Submission

MSc. [CA & IT]

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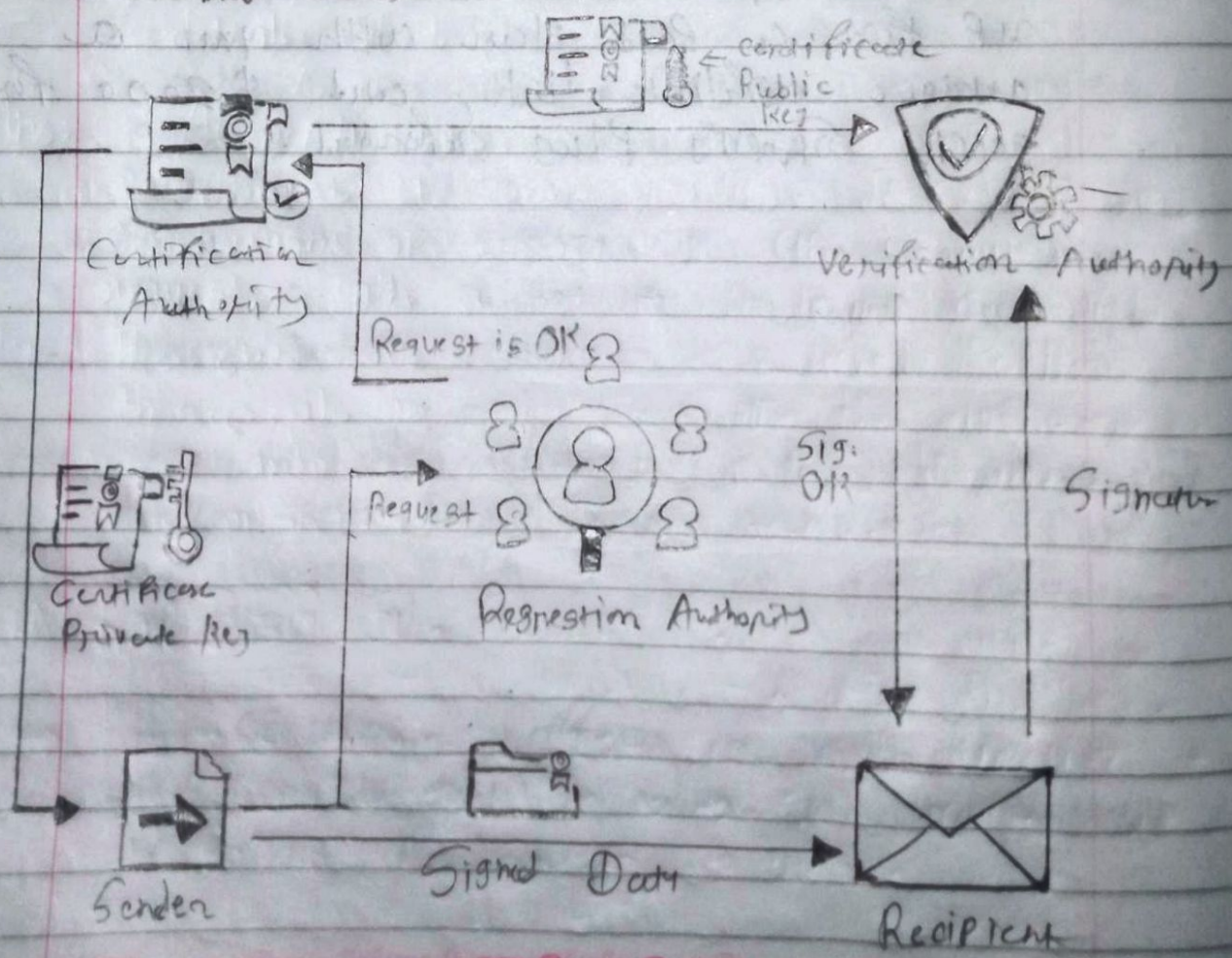
Information Security

Q.1 What is digital certificate ?
Explain Public Key infrastructure.

→ "A Digital Certificate is an electronic 'Password' that allows a Person, organization to exchange data securly over the Internet using the Public Key infrastructure (PKI). Digital Certificate is also known as a Public Key certificate or identity certificate."

Public Key Infrastructure



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* Public Key Infrastructure:

* Identification / Authentication:

The Persons / entities with whom we are communication are really who they say they are.

* Confidentiality:

The information with the message or transaction is kept confidential. It may only be read & understood by the intended sender and receiver.

* Integrity:

The information ~~with~~ within the message or transaction is not tampered accidentally or deliberately with ~~xx~~ en route without all parties involved being aware of the tampering.

* Non-Repudiation:

The sender can't deny sending the message or transaction, and the receiver can't deny receiving it.

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* Access Control:

Access to the Protected information is only realized by the intended person or entity.

→ All of the above Security Properties can be achieved and implemented through the use of Public Key Infrastructure.

Q.2 What Authetication? Explain KERBEROS in detail.

Ans: Authentication is the Process of recognizing a user's identity. It is the mechanism of associating an incoming request with a set of identifying credentials. The credentials Provided are compared to those on a file in a database of the authorized user's info. on a local operating System or within an authentication Server.

* KERBEROS :-

→ Kerberos Provides a centralized authentication Server whose function is to authenticate users to Servers and Servers to users.

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→ In Kerberos Authetication Server and database is used for client authentication.

→ Kerberos runs as a third-Party trusted Server known as the Key Distribution Center (KDC). Each user and service on the network is a Principal.

- The main Components of Kerberos are:

* Authentication Server :
The AS Performs the initial authentication & ticket for Ticket Granting Service.

* Database :
The Authentication Server verifies access rights of users in database.

* Ticket Granting Server (TGS) :
The Ticket Granting Server issues the ticket for the Server.

Step 7: User logon & request services on host. Thus user req. for ticket granting-service.

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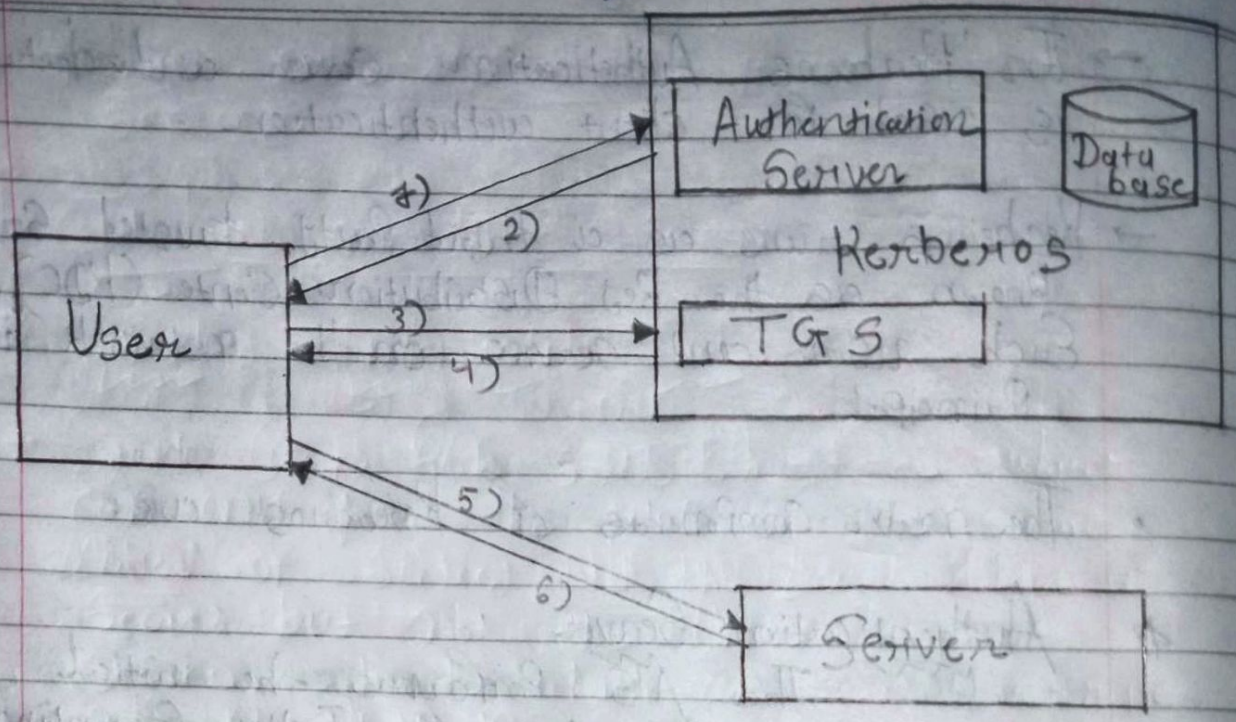

Step:2 AS verifies user's access right using database & then gives ticket-granting-ticket & session key. Results are encrypted using Password of user.

Step:3 Decryption of msg. is done using the Password then send the ticket to Ticket Granting Server. The Ticket contain authentications like user name & network address.

Step:4 Ticket Granting Server decrypts the ticket send by User & Authenticator verifies the req. then creates the ticket for Req. Services from the Server.

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Step. 5: User send the Ticket and Authentication to the Server.

Step. 6: Server verifies the Tickets & authenticating then generate the access to the Service. After this User can access the Services.

Q.3 Diff. Types of Information Security Model.

Ans: These models are used for maintaining goals of security, i.e. Confidentiality, Integrity, & Availability. In Simple words, it details with CIA Triad maintenance.

- There are 3 main types of Classic Security Models.

(1) Bell - LaPadula :

→ This Model was invented by Scientists David Elliot Bell and Leonard J. LaPadula.

→ Thus this model is called the Bell-LaPadula Model. This is used to maintain the Confidentiality of Security.

→ Here, the classification of Subjects (Users) & Objects (Files) are Organized in a non-discretionary

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fashion, with respect to different levels of secrecy.

→ It has mainly 3 Rules:

- Simple Confidentiality Rule:

→ Simple Conf. Rule states that the Subject can only Read the files on the same Level of Secrecy and the Lower Level of Secrecy but not the Upper Level of Secrecy, due to which we call this rule as No READ-UP.

- Star Confidentiality Rule:

→ This rule states that the subject can only write the files on the same Level of Secrecy & the Upper Level of Secrecy & the Upper Level of Secrecy but not the Lower Level of Secrecy, due to which we call this rule as NO WRITE-DOWN.

- Strong Star Confidentiality Rule:

→ Strong Star Confidentiality Rule is highly secured and strongest which states that the Subject can Read and write the files on the same Level of Secrecy only

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and not the Upper Layer of Secrecy or the Lower Layer of Secrecy, due to which we call this rule as NO READ WRITE UP DOWN.

② Bibo :-

→ This Model invented by Scientist Kenneth. J. Bibo. This is used to maintain the Integrity of Security. Here, the classification of Subjects & Objects are organized in a non-discretionary fashion, with respect to diff. layers of Secrecy.

→ This works the exact reverse of the Bello-LaPadula Model.

* 3 Rules:

• Simple Integrity Rule:

Integrity Rule states that the Subject can only Read the files on the Same Layer of Secrecy and the Upper Layer of Secrecy but not the Lower Layer of Secrecy, due to which we call this rule as NO READ DOWN.

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- **Star Integrity Rule:**

→ Star Integrity Rule states that the Subject can only Write the files on the Same Layer of Secrecy & the Lower Layer of Secrecy but not the Upper Layer of Secrecy, due to which we call this rule as NO WRITE-UP

- **STRONG STAR INTEGRITY RULE.**

③ **Clarke Wilson Security Model :-**

→ This Model is a highly Secured model. It has the following entities.

- **SUBJECT:** It is any user who is requesting for Data Items.
- **CONSTRAINED DATA ITEMS:** It can't be accessed directly by the Subject. These need to be accessed via Clarke Wilson Security Model
- **UNCONSTRAINED DATA ITEMS:** It can be accessed directly by the Subject.

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Q.4. What is Tunneling ? Explain IP Sec.

→ "In the physical world, tunneling is a way to cross terrain or boundaries that could not normally be crossed."

→ Similarly, in networking, tunnels are a method for transporting data accrossed a network using protocols that are not supported by that network.

→ Tunneling works by encapsulation packets: wrapping packets inside of other packets.

→ Tunnelling is often used in virtual private networks. It can also set up efficient and secure connections between networks, enable the usage of unsupported network protocols, and in some cases allow users to bypass firewalls.

IP Sec :

→ IP Sec is a suite of protocols and algorithms for securing data transmitted over the internet or any public network.

→ The internet Engineering Task Force, or IETF, developed the IPSec protocols

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in the mid-1990s to Provide Security at the IP layer through authentication and encryption of IP network Packets.

* The following are key IPsec Protocols :-

- **IP AH** :- AH is specified in RFC 4302. It Provides data integrity and transport Protection Services.
AH was designed to be inserted into an IP Packet to add authentication data and Protect the contents from modification.

- **IP ESP** :- Specified in RFC 4303, ESP Provides authentication, integrity and confidentiality through encryption of IP Packets.

- **IKE** :- Defined in RFC 7296, IKE is a Protocol that enables two system OR devices to establish a secure communication channel over an untrusted network.

- **Internet Security Association and Key Mgt. Protocol (ISAKMP)** :-

ISAKMP is specified as Part of the IKE Protocol and RFC 7296. It is a framework for key establishment, authentication

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and negotiation of an SA for a secure exchange of Packets of the IP layer.

→ There are five key steps involved with how IPsec works.

(1) Host Recognition:
(2) Negotiation, or IKE Phase 1
(3) IP Sec circuit, or IKE Phase 2
(4) IPSec transmission.
(5) IP Sec termination.