Government Polytechnic Palanpur

Information & Communication Technology

Cyber Security (4353204) - Unit 1 & Unit 2 Question Bank

Subject Name & Code: Cyber Security (4353204)
Semester: 5
Coverage: Unit 1 & Unit 2
Question Types: Short Answer & Long Answer

Unit I: Introduction to Cyber Security & Cryptography

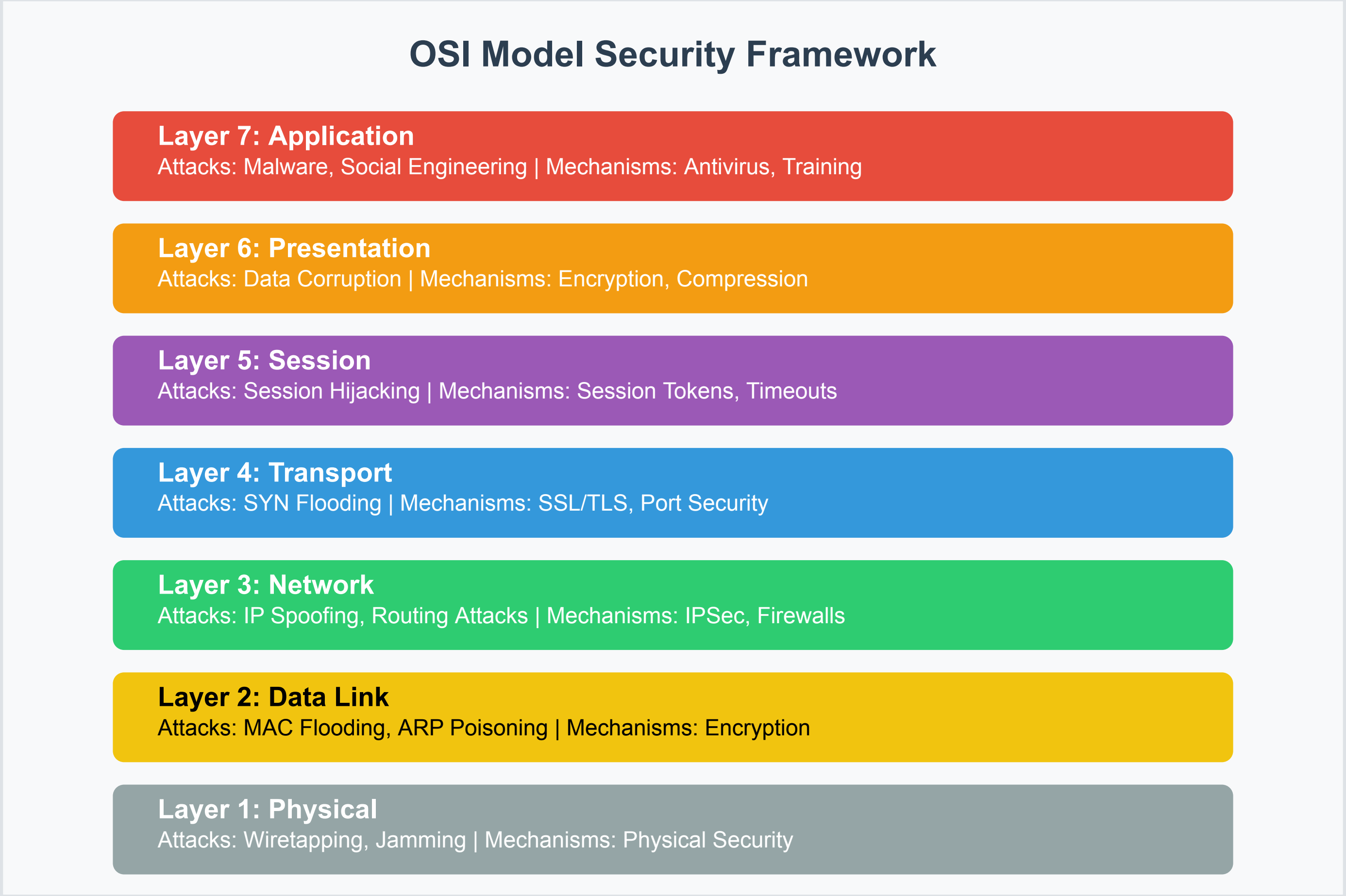
Important Questions from Unit 1

Question 1 [7 marks]

Explain various security attacks, mechanisms, and services associated with each layer of the OSI model.

Answer:

OSI Security Framework:



OSI Model Security Framework

Layer 7: Application
Attacks: Malware, Social Engineering | Mechanisms: Antivirus, Training

Layer 6: Presentation
Attacks: Data Corruption | Mechanisms: Encryption, Compression

Layer 5: Session
Attacks: Session Hijacking | Mechanisms: Session Tokens, Timeouts

Layer 4: Transport
Attacks: SYN Flooding | Mechanisms: SSL/TLS, Port Security

Layer 3: Network
Attacks: IP Spoofing, Routing Attacks | Mechanisms: IPSec, Firewalls

Layer 2: Data Link
Attacks: MAC Flooding, ARP Poisoning | Mechanisms: Encryption

Layer 1: Physical
Attacks: Wiretapping, Jamming | Mechanisms: Physical Security

Layer	Attacks	Mechanisms	Services
Physical	Wiretapping, Jamming	Physical security, Shielding	Access control
Data Link	MAC flooding, ARP poisoning	Encryption, Authentication	Frame integrity
Network	IP spoofing, Routing attacks	IPSec, Firewalls	Packet filtering
Transport	Session hijacking, SYN flooding	SSL/TLS, Port security	End-to-end security
Session	Session replay, Hijacking	Session tokens, Timeouts	Session management
Presentation	Data corruption, Format attacks	Encryption, Compression	Data transformation
Application	Malware, Social engineering	Antivirus, User training	Application security

Key Security Services:

- **Authentication**: Verifying user identity
- **Authorization**: Controlling access permissions
- **Non-repudiation**: Preventing denial of actions
- **Data integrity**: Ensuring data accuracy

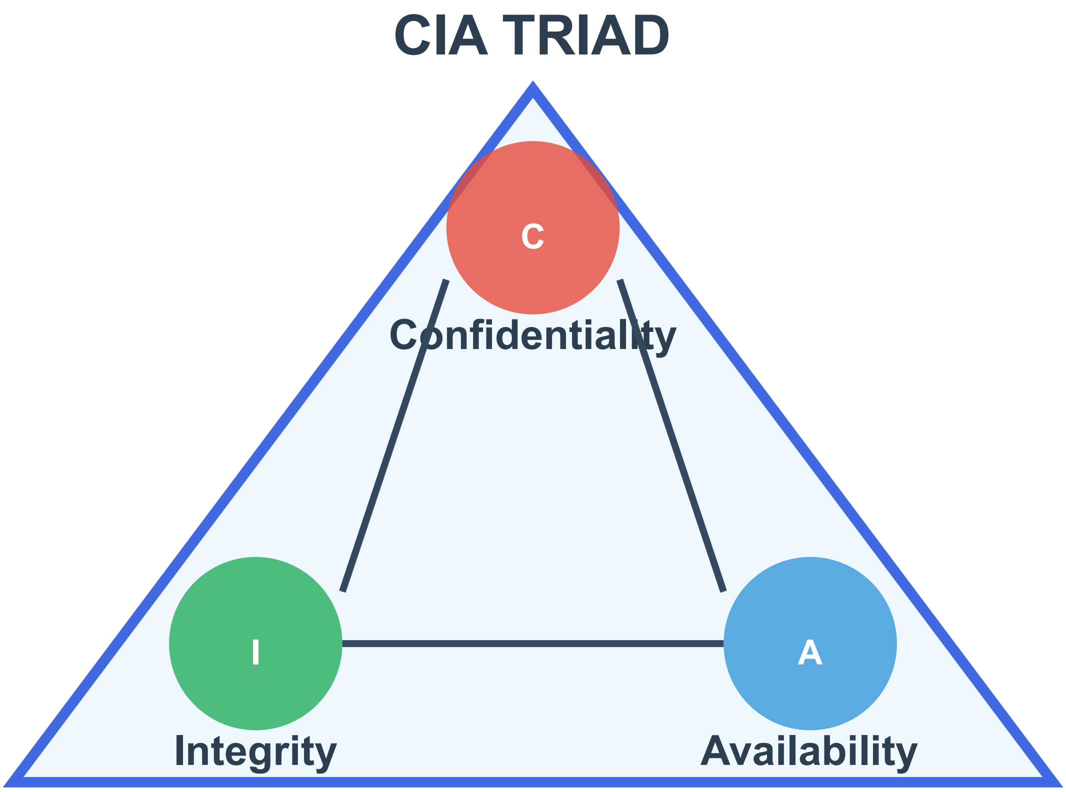
Mnemonic: "All People Seem To Need Data Protection"

Question 2 [3 marks]

Describe CIA triad with example.

Answer:

CIA Triad Components:



Component	Definition	Example
Confidentiality	Protecting data from unauthorized access	Password protection on bank accounts
Integrity	Ensuring data accuracy and completeness	Digital signatures on documents
Availability	Ensuring systems are accessible when needed	24/7 online banking services

- **Confidentiality**: Only authorized users can access sensitive information
- **Integrity**: Data remains accurate and unaltered during transmission
- **Availability**: Systems remain operational and accessible to legitimate users

Mnemonic: "CIA Keeps Information Safe"

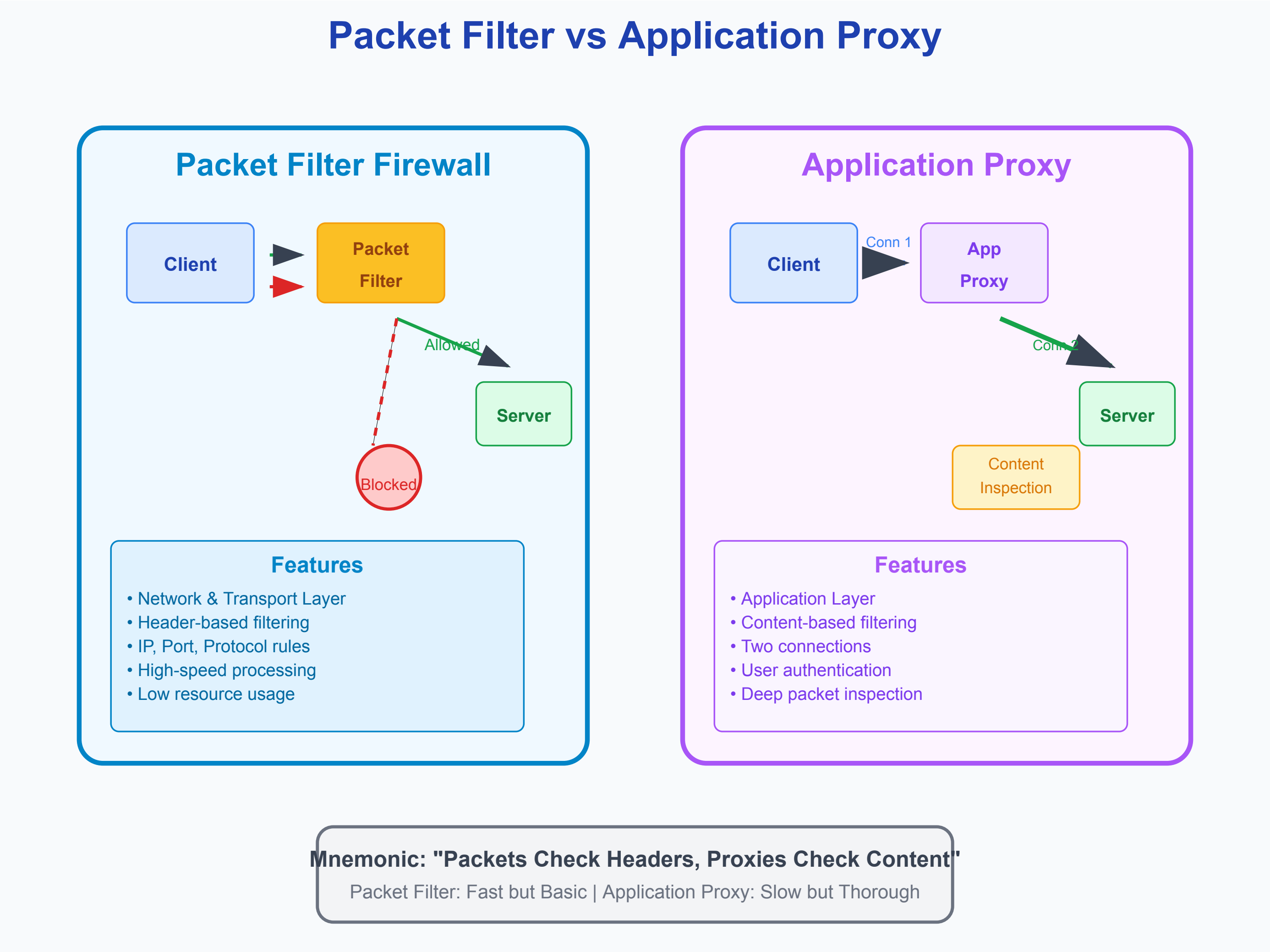
Question 3 [7 marks]

Explain MD5 hashing and Secure Hash Function (SHA) algorithms.

Answer:

Firewall Type	Working
Packet Filter	Examines packet headers based on predefined rules. Makes decisions based on source/destination IP addresses, ports, and protocols. Works at OSI network and transport layers. Offers high-speed filtering with low resource usage.
Application Proxy	Acts as intermediary between client and server applications. Processes all traffic at application layer. Creates two connections (client-to-proxy and proxy-to-server). Provides content inspection and user authentication capabilities.

Diagram:



Features

- Network & Transport Layer
- Header-based filtering
- IP, Port, Protocol rules
- High-speed processing
- Low resource usage

Features

- Application Layer
- Content-based filtering
- Two connections
- User authentication
- Deep packet inspection

Mnemonic: "Packets Check Headers, Proxies Check Content"

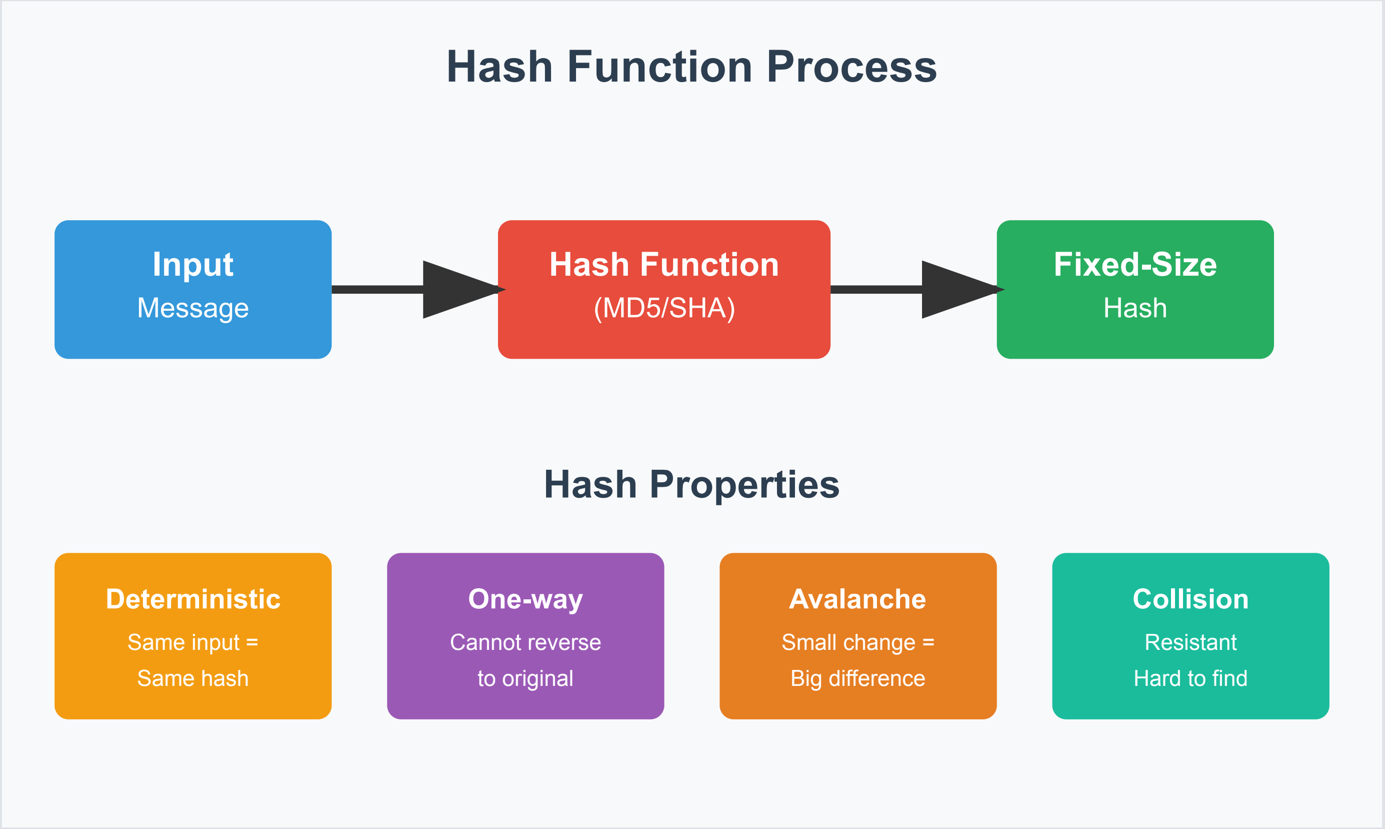
Packet Filter: Fast but Basic | Application Proxy: Slow but Thorough

Key Differences:

Feature	Packet Filter	Application Proxy
Speed	Fast	Slower
Security	Basic	Advanced
Resource Usage	Low	High
Content Inspection	Header only	Full content

Answer:

Hash Function Comparison:



Feature	MD5	SHA-1	SHA-256
Output Size	128 bits	160 bits	256 bits
Security Level	Weak	Weak	Strong
Speed	Fast	Moderate	Slower
Current Status	Deprecated	Deprecated	Recommended

MD5 Algorithm Process:

1. **Input Processing**: Message is padded and divided into 512-bit blocks
2. **Initialization**: Sets up four 32-bit registers with fixed values
3. **Compression**: Processes message in 16-word blocks through four rounds of operations

4. **Output**: Produces 128-bit digest as final hash value

SHA Algorithm Features:

- **Deterministic**: Same input produces same hash
- **Avalanche Effect**: Small input change causes major hash change
- **One-way Function**: Cannot reverse hash to original data
- **Collision Resistant**: Difficult to find two inputs with same hash

Applications:

- Password storage and verification
- Digital signatures and certificates
- Data integrity verification

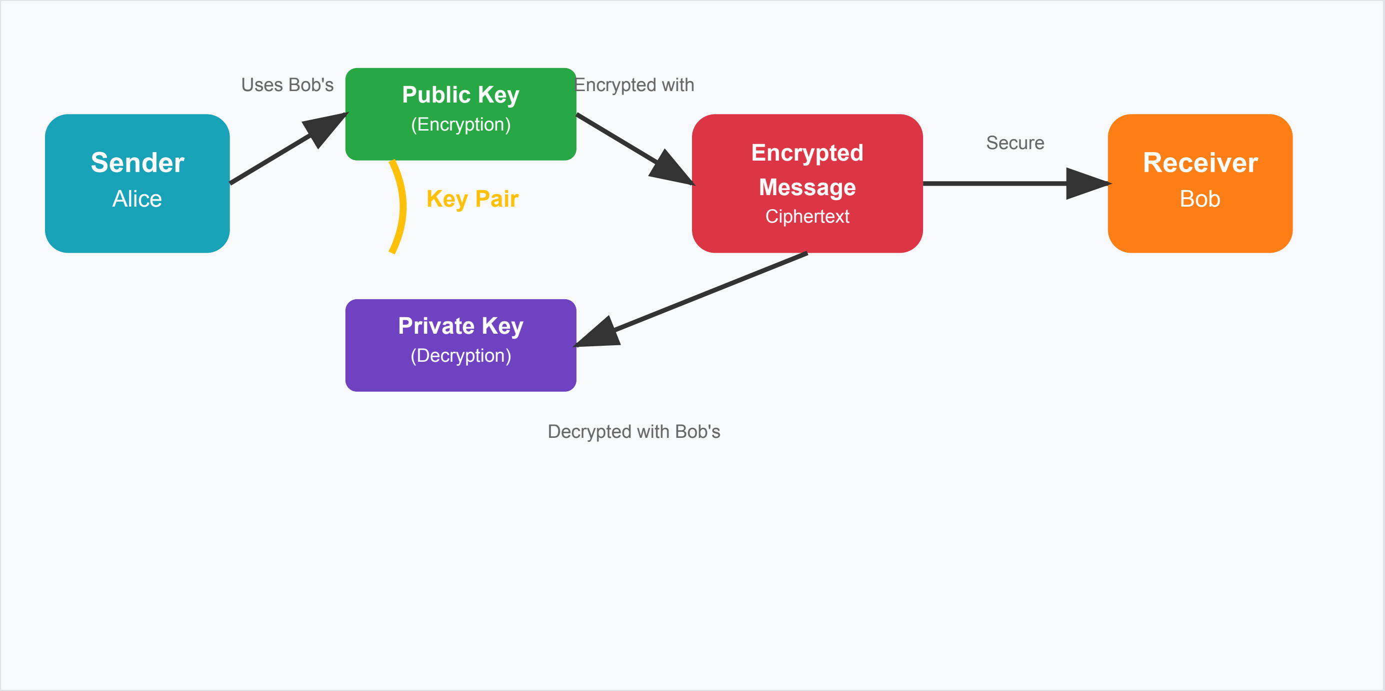
Mnemonic: "Hash Always Produces Same Output"

Question 4 [3 marks]

Explain Public key and Private Key cryptography.

Answer:

Public Key Cryptography (Asymmetric):



Key Characteristics:

Feature	Public Key	Private Key
Distribution	Freely shared	Kept secret
Usage	Encryption/Verification	Decryption/Signing
Security	Can be public	Must be protected

- **Public Key**: Used for encryption and signature verification
- **Private Key**: Used for decryption and digital signing
- **Security**: Based on mathematical complexity (RSA, ECC algorithms)

Example: In RSA encryption, if Alice wants to send Bob a message:

1. Alice encrypts with Bob's public key
2. Only Bob can decrypt using his private key

Mnemonic: "Public Encrypts, Private Decrypts"

Unit II: Account and Data Security

Important Questions from Unit 2

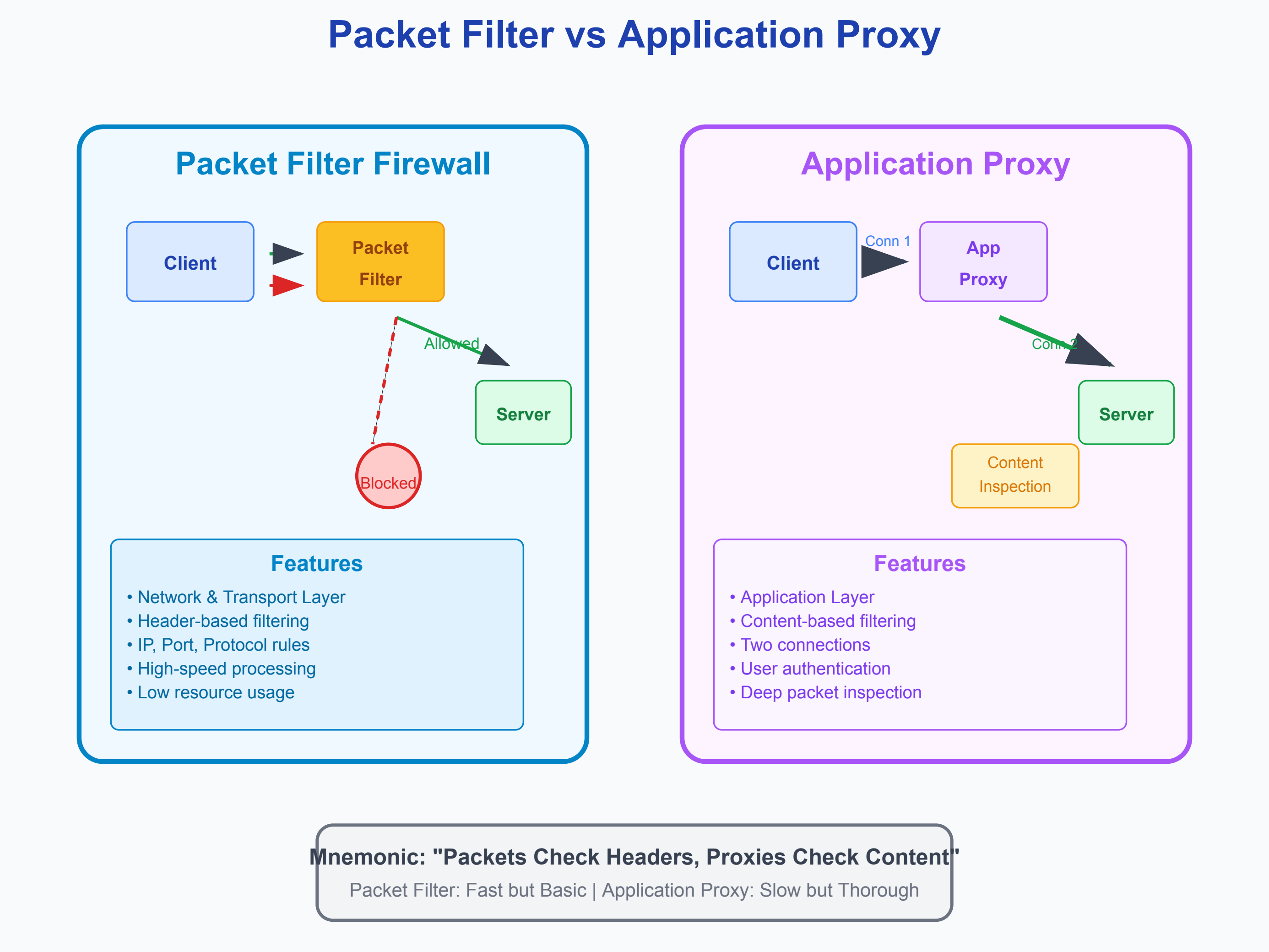
Question 5 [7 marks]

Explain working of packet filter and application proxy.

Answer:

Firewall Type	Working
Packet Filter	Examines packet headers based on predefined rules. Makes decisions based on source/destination IP addresses, ports, and protocols. Works at OSI network and transport layers. Offers high-speed filtering with low resource usage.
Application Proxy	Acts as intermediary between client and server applications. Processes all traffic at application layer. Creates two connections (client-to-proxy and proxy-to-server). Provides content inspection and user authentication capabilities.

Diagram:



Key Differences:

Feature	Packet Filter	Application Proxy
Speed	Fast	Slower
Security	Basic	Advanced
Resource Usage	Low	High
Content Inspection	Header only	Full content

Mnemonic: "Packets Check Headers, Proxies Check Content"

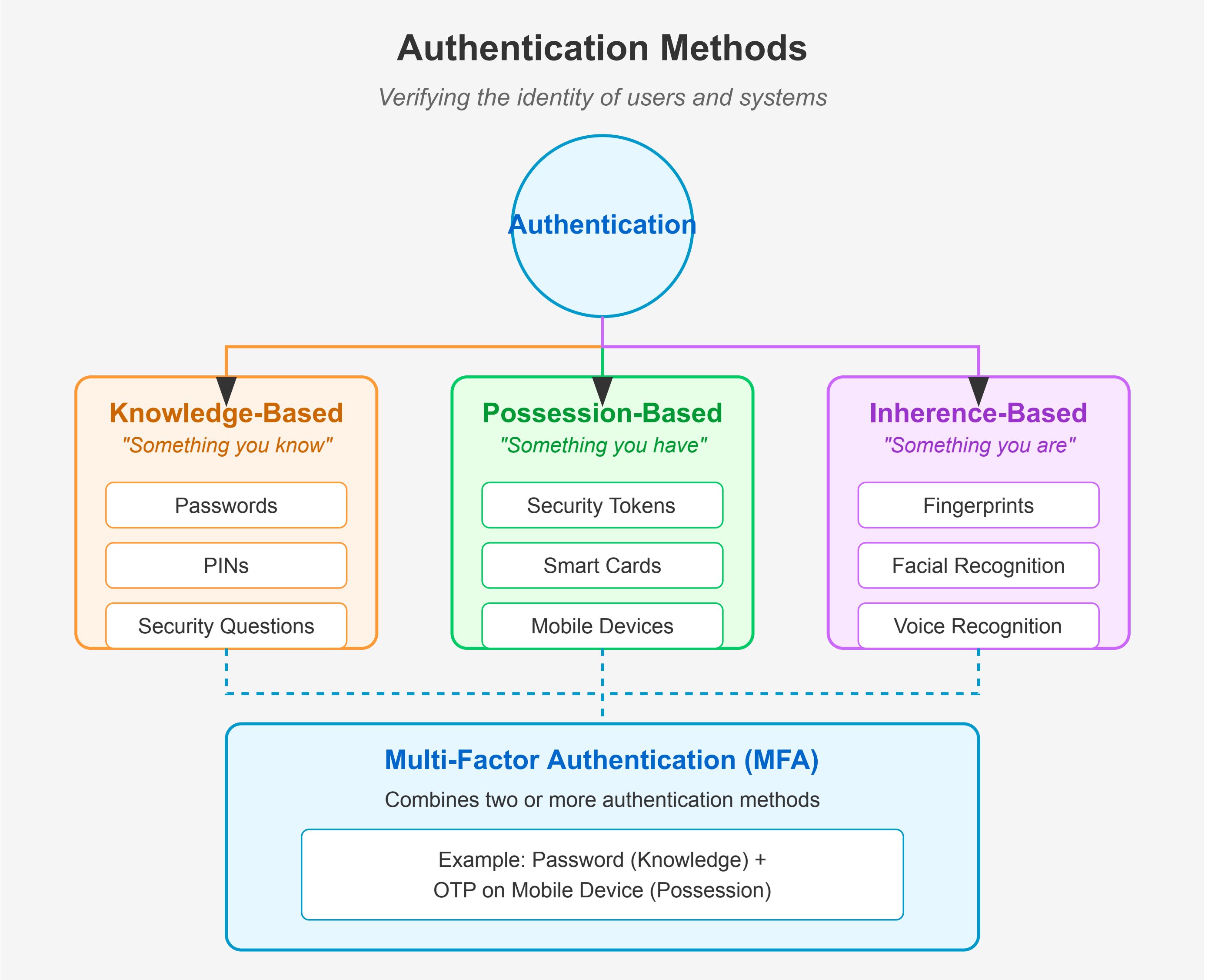
Question 6 [3 marks]

What is authentication? Explain different methods of authentication.

Answer:

Authentication Definition:
Process of verifying user identity before granting system access.

Authentication Methods:



Method	Description	Example
Password	Something you know	PIN, passphrase
Biometric	Something you are	Fingerprint, iris
Token	Something you have	Smart card, USB key

- **Single-Factor**: Uses one authentication method
- **Multi-Factor**: Combines multiple methods
- **Two-Factor (2FA)**: Uses exactly two factors

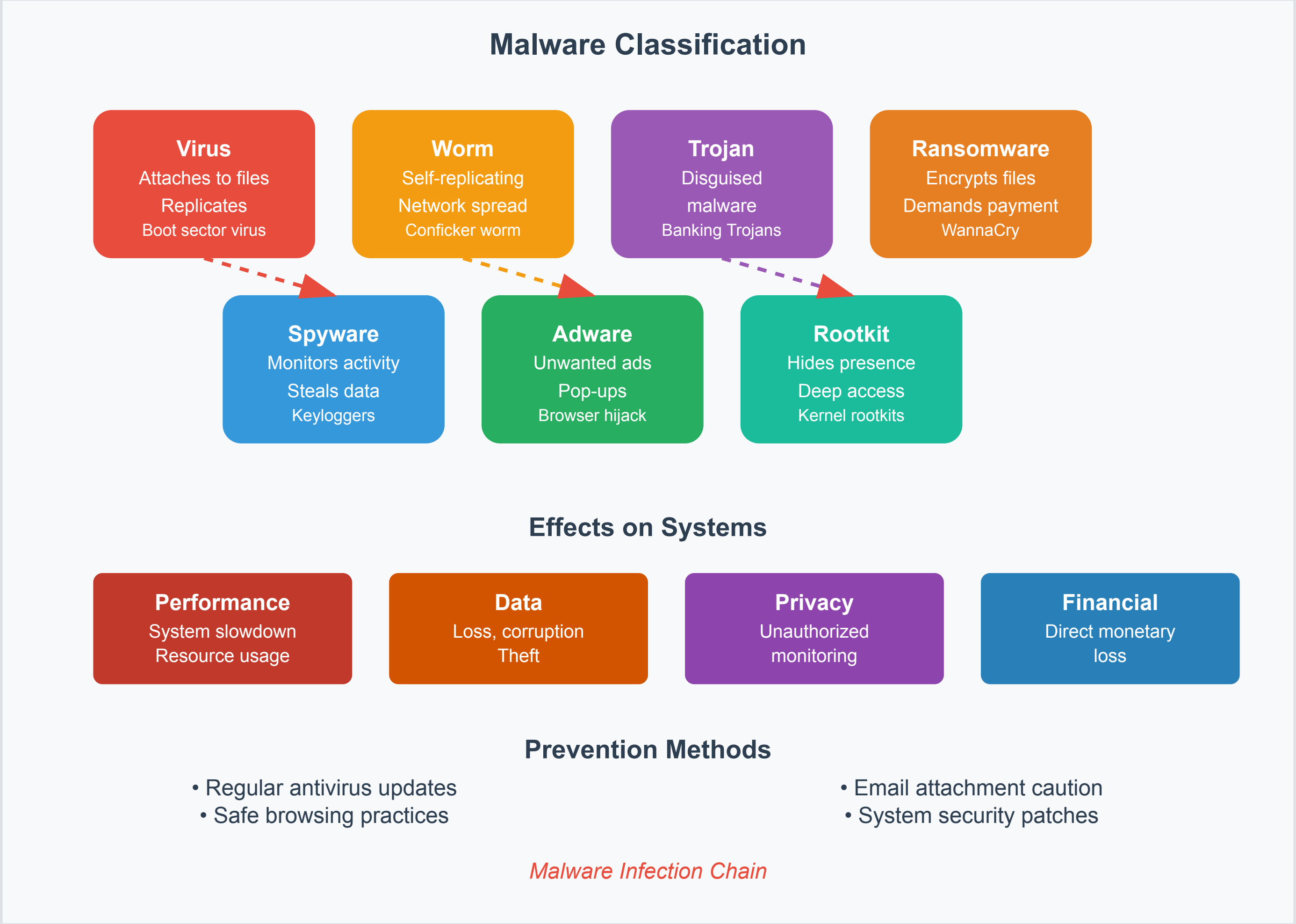
Mnemonic: "Password Biometric Token Authentication"

Question 7 [7 marks]

Explain different types of malicious software and their effect.

Answer:

Malware Classification:



Type	Behavior	Effect	Example
Virus	Attaches to files	File corruption	Boot sector virus
Worm	Self-replicating	Network congestion	Conficker worm
Trojan	Disguised malware	Data theft	Banking Trojans
Ransomware	Encrypts files	Data hostage	WannaCry
Spyware	Monitors activity	Privacy breach	Keyloggers
Adware	Shows unwanted ads	Performance degradation	Pop-up ads
Rootkit	Hides presence	System compromise	Kernel rootkits

Effects on Systems:

- **Performance**: Slow system response
- **Data**: Loss, corruption, or theft
- **Privacy**: Unauthorized monitoring
- **Financial**: Direct monetary loss

Prevention Methods:

- Regular antivirus updates
- Safe browsing practices
- Email attachment caution
- System security patches

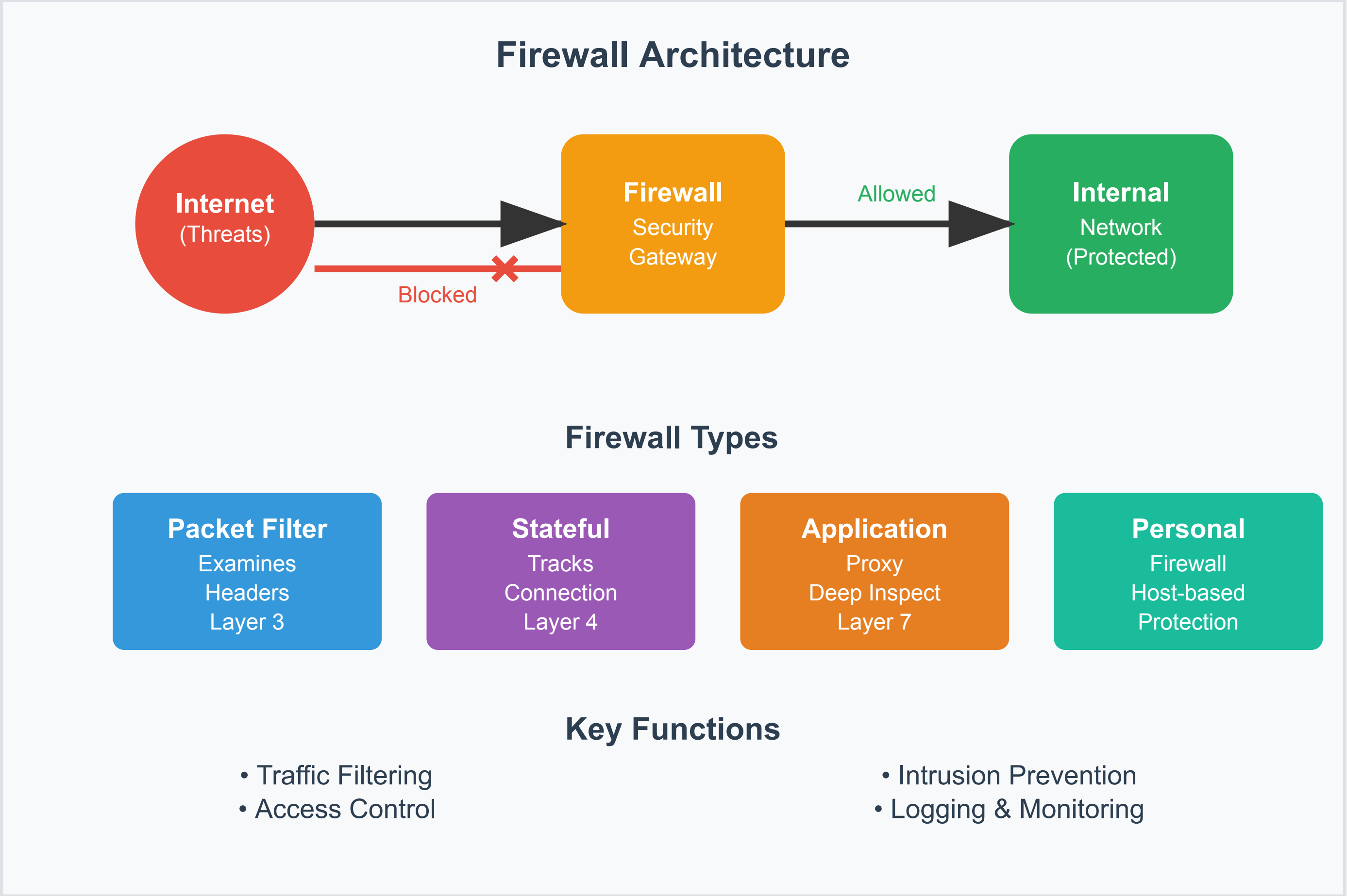
Mnemonic: "Viruses Worms Trojans Really Steal All Resources"

Question 8 [3 marks]

What is firewall? List out types of firewalls.

Answer:

Firewall Definition:
Network security device that monitors and controls incoming/outgoing traffic based on security rules.



Types of Firewalls:

Type	Function	Level
Packet Filter	Examines packet headers	Network Layer
Stateful	Tracks connection state	Transport Layer
Application Proxy	Inspects application data	Application Layer
Personal Firewall	Protects individual devices	Host-based

- **Hardware Firewall**: Dedicated network appliance
- **Software Firewall**: Installed on individual computers
- **Cloud Firewall**: Delivered as a service (FWaaS)

Mnemonic: "Firewalls Protect Networks Always"

Study Tips for Unit 1 & Unit 2

Unit 1 Focus Areas

1. **Security Fundamentals -** OSI model security layers
2. **CIA Triad -** Core principles of information security
3. **Cryptography Basics -** Hash functions and encryption types

Unit 2 Focus Areas

1. **Network Security -** Firewalls, packet filtering, proxies
2. **Authentication Systems -** Methods and multi-factor authentication
3. **Malware Analysis -** Types, effects, and prevention strategies

Exam Preparation Tips

- Practice drawing network diagrams and security frameworks
- Memorize comparison tables for different security technologies
- Understand real-world applications of theoretical concepts
- Focus on the working principles behind security mechanisms
- Review mnemonics for better concept recall

Key Topics Coverage

- **Unit 1**: Introduction to Cyber Security, Security Models, Cryptographic Foundations
- **Unit 2**: Network Security, Authentication Mechanisms, Threat Analysis

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Note: These questions cover fundamental concepts from Unit 1 and Unit 2 that are commonly asked in examinations. Practice these thoroughly for better understanding of cyber security principles.