

# Subject Name Solutions

4353204 – Summer 2025

Semester 1 Study Material

*Detailed Solutions and Explanations*

## Question 1(a) [3 marks]

Describe CIA triad with example.

### Solution

#### CIA Triad Components:

Component	Definition	Example
<b>Confidentiality</b>	Protecting data from unauthorized access	Password protection on bank accounts
<b>Integrity</b>	Ensuring data accuracy and completeness	Digital signatures on documents
<b>Availability</b>	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 1(b) [4 marks]

Explain Public key and Private Key cryptography.

### Solution

#### Public Key Cryptography (Asymmetric): Key Characteristics:

Feature	Public Key	Private Key
<b>Distribution</b>	Freely shared	Kept secret
<b>Usage</b>	Encryption/Verification	Decryption/Signing
<b>Security</b>	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)

### Mnemonic

“Public Encrypts, Private Decrypts”

## Question 1(c) [7 marks]

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

## Solution

### OSI Security Framework:

Layer	Attacks	Mechanisms	Services
<b>Physical</b>	Wiretapping, Jamming	Physical security, Shielding	Access control
<b>Data Link</b>	MAC flooding, ARP poisoning	Encryption, Authentication	Frame integrity
<b>Network</b>	IP spoofing, Routing attacks	IPSec, Firewalls	Packet filtering
<b>Transport</b>	Session hijacking, SYN flooding	SSL/TLS, Port security	End-to-end security
<b>Session</b>	Session replay, Hijacking	Session tokens, Timeouts	Session management
<b>Presentation</b>	Data corruption, Format attacks	Encryption, Compression	Data transformation
<b>Application</b>	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 1(c OR) [7 marks]

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

## Solution

### Hash Function Comparison:

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

### Mermaid Diagram (Code)

```
{Shaded}
{Highlighting}[]
graph LR
    A[Input Message] --> B[Hash Function]
    B --> C[Fixed-Size Hash]
    C --> D[Digital Fingerprint]
{Highlighting}
{Shaded}
```

#### Hash Properties:

- **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 2(a) [3 marks]

What is firewall? List out types of firewall.

### Solution

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

#### Types of Firewalls:

Type	Function	Level
<b>Packet Filter</b>	Examines packet headers	Network Layer
<b>Stateful</b>	Tracks connection state	Transport Layer
<b>Application Proxy</b>	Inspects application data	Application Layer
<b>Personal Firewall</b>	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”

## Question 2(b) [4 marks]

Define: HTTPS and describe working of HTTPS.

### Solution

**HTTPS Definition:** Hypertext Transfer Protocol Secure - HTTP over SSL/TLS encryption.

#### HTTPS Working Process:

#### HTTPS Components:

- **Port 443:** Standard HTTPS port
- **SSL/TLS:** Encryption protocols

- **Digital Certificates:** Server authentication
- **Symmetric Encryption:** Data transmission security

**Benefits:**

- Data encryption during transmission
- Server authentication verification
- Data integrity protection
- SEO ranking improvement

**Mnemonic**

“HTTPS Secures Web Traffic”

**Question 2(c) [7 marks]**

Explain different types of malicious software and their effect.

**Solution**

**Malware Classification:**

Type	Behavior	Effect	Example
<b>Virus</b>	Attaches to files	File corruption	Boot sector virus
<b>Worm</b>	Self-replicating	Network congestion	Conficker worm
<b>Trojan</b>	Disguised malware	Data theft	Banking Trojans
<b>Ransomware</b>	Encrypts files	Data hostage	WannaCry
<b>Spyware</b>	Monitors activity	Privacy breach	Keyloggers
<b>Adware</b>	Shows unwanted ads	Performance degradation	Pop-up ads
<b>Rootkit</b>	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 2(a OR) [3 marks]**

What is authentication? Explain different methods of authentication.

**Solution**

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

**Authentication Methods:**

Method	Description	Example
<b>Password</b>	Something you know	PIN, passphrase
<b>Biometric</b>	Something you are	Fingerprint, iris
<b>Token</b>	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 2(b OR) [4 marks]

Define: Trojans, Rootkit, Backdoors, Keylogger

#### Solution

##### Malware Definitions:

Term	Definition	Characteristics
<b>Trojans</b>	Malware disguised as legitimate software	Appears harmless, hidden payload
<b>Rootkit</b>	Software that hides malware presence	Deep system access, stealth operation
<b>Backdoors</b>	Unauthorized access method	Bypasses normal authentication
<b>Keylogger</b>	Records keyboard input	Captures passwords, sensitive data

- **Trojans:** Named after Greek Trojan Horse
- **Rootkit:** Operates at kernel level
- **Backdoors:** Can be hardware or software based
- **Keylogger:** Can be software or hardware device

#### Mnemonic

“Trojans Root Backdoors Keylog”

### Question 2(c OR) [7 marks]

Explain Secure Socket Layer (SSL) and Transport Layer Security (TLS) protocols.

#### Solution

##### SSL/TLS Protocol Evolution:

Version	Year	Status	Security Level
<b>SSL 2.0</b>	1995	Deprecated	Weak
<b>SSL 3.0</b>	1996	Deprecated	Vulnerable
<b>TLS 1.0</b>	1999	Legacy	Limited
<b>TLS 1.2</b>	2008	Widely used	Good
<b>TLS 1.3</b>	2018	Current	Strong

### TLS Handshake Process:

sequenceDiagram

```
participant C as Client
participant S as Server
C->>S: ClientHello
S->>C: ServerHello + Certificate
C->>S: Key Exchange
S->>C: Finished
Note over C,S: Secure Channel Established
```

### Key Features:

- **Encryption:** Symmetric and asymmetric algorithms
- **Authentication:** Server and client verification
- **Integrity:** Message authentication codes
- **Forward Secrecy:** Session key protection

### Applications:

- HTTPS web browsing
- Email security (SMTPS)
- VPN connections
- Secure file transfers

### Mnemonic

“TLS Encrypts All Network Traffic”

## Question 3(a) [3 marks]

Explain in detail cybercrime and cybercriminal.

### Solution

**Cybercrime Definition:** Criminal activities conducted through computers or internet networks.

**Diagram:**

**Cybercriminal Types:**

Type	Motivation	Skills	Target
<b>Script Kiddies</b>	Fun/Fame	Low	Random
<b>Hacktivists</b>	Political/Social	Moderate	Organizations
<b>Cybercriminals</b>	Financial Gain	High	Individuals/Banks

- **Cybercrime:** Illegal activities using digital technology
- **Cybercriminal:** Person who commits cybercrimes
- **Impact:** Financial loss, privacy breach, system damage

### Mnemonic

“Cyber Criminals Create Chaos”

## Question 3(b) [4 marks]

Describe cyber stalking and cyber bullying in detail.

### Solution

**Digital Harassment Comparison:**

Aspect	Cyber Stalking	Cyber Bullying
<b>Target</b>	Specific individual	Often minors

<b>Duration</b>	Persistent, long-term	Can be episodic
<b>Intent</b>	Intimidation, control	Harassment, humiliation
<b>Platform</b>	Social media, email	Schools, gaming platforms

#### Cyber Stalking Characteristics:

- Persistent unwanted contact
- Monitoring victim's online activity
- Threatening messages or behavior
- Identity theft or impersonation

#### Cyber Bullying Forms:

- Public humiliation online
- Exclusion from digital groups
- Spreading false information
- Sharing private content without consent

#### Prevention Measures:

- Privacy settings on social media
- Reporting harassment to platforms
- Legal action when necessary
- Digital literacy education

#### Mnemonic

"Stop Bullying, Report Stalking"

### Question 3(c) [7 marks]

Explain Property based classification in cybercrime.

#### Solution

#### Property-Based Cybercrime Categories:

Category	Crime Type	Description	Example
<b>Intellectual Property</b>	Copyright infringement	Unauthorized use of copyrighted material	Software piracy
<b>Financial Property</b>	Credit card fraud	Unauthorized use of financial information	Online shopping fraud
<b>Digital Property</b>	Data theft	Stealing digital information	Database breaches
<b>Virtual Property</b>	Gaming asset theft	Stealing virtual goods	Online game currency theft

#### Diagram:

#### Legal Aspects:

- **Copyright Laws:** Protect creative works
- **Trademark Laws:** Protect brand identity
- **Patent Laws:** Protect inventions
- **Trade Secret Laws:** Protect confidential information

#### Impact on Economy:

- Revenue loss for legitimate businesses
- Reduced innovation incentives
- Consumer trust erosion
- Legal enforcement costs

#### Prevention Strategies:

- Digital rights management (DRM)
- Watermarking and tracking
- Legal enforcement mechanisms
- Public awareness campaigns

### Mnemonic

“Property Protection Prevents Piracy”

### Question 3(a OR) [3 marks]

Explain Data diddling.

#### Solution

**Data Diddling Definition:** Unauthorized alteration of data before or during input into computer systems.  
**Characteristics:**

Aspect	Description
<b>Method</b>	Changing data values
<b>Timing</b>	Before system processing
<b>Detection</b>	Often difficult to identify

- **Examples:** Changing salary figures, altering exam scores
- **Target:** Input data during entry process
- **Impact:** Financial loss, incorrect records

### Mnemonic

“Data Diddling Damages Databases”

### Question 3(b OR) [4 marks]

Explain cyber spying and cyber terrorism.

#### Solution

**Cyber Threats Comparison:**

Aspect	Cyber Spying	Cyber Terrorism
<b>Purpose</b>	Information gathering	Causing fear/disruption
<b>Target</b>	Government, corporations	Critical infrastructure
<b>Methods</b>	Stealth infiltration	Destructive attacks
<b>Impact</b>	Intelligence loss	Public safety risk

**Cyber Spying Activities:**

- Corporate espionage
- Government surveillance
- Trade secret theft
- Personal information gathering

**Cyber Terrorism Methods:**

- Infrastructure attacks
- Mass disruption campaigns
- Psychological warfare
- Economic damage

**Prevention Measures:**

- Network security monitoring
- Incident response planning
- International cooperation
- Public-private partnerships

### Mnemonic

“Spies Steal, Terrorists Terror”



### Question 3(c OR) [7 marks]

Explain the role of digital signatures and digital certificates in cybersecurity.

#### Solution

##### Digital Security Components:

Component	Purpose	Function	Benefit
Digital Signature	Authentication	Proves sender identity	Non-repudiation
Digital Certificate	Verification	Validates public keys	Trust establishment

##### Digital Signature Process:

##### Mermaid Diagram (Code)

```
{Shaded}
{Highlighting}[]
graph LR
    A[Document] --> B[Hash Function]
    B --> C[Message Digest]
    C --> D[Private Key Encryption]
    D --> E[Digital Signature]
    E --> F[Verification with Public Key]
{Highlighting}
{Shaded}
```

##### Digital Certificate Components:

- **Subject Information:** Certificate owner details
- **Public Key:** For encryption/verification
- **Digital Signature:** CA's signature
- **Validity Period:** Certificate expiration date

##### Certificate Authority (CA) Role:

- Issues digital certificates
- Verifies identity before issuance
- Maintains certificate revocation lists
- Provides trust infrastructure

##### Applications in Cybersecurity:

- Email security (S/MIME)
- Code signing for software
- SSL/TLS certificates for websites
- Document authentication

##### Security Benefits:

- **Authentication:** Verifies sender identity
- **Integrity:** Ensures data hasn't been modified
- **Non-repudiation:** Prevents denial of actions
- **Confidentiality:** Enables secure communication

#### Mnemonic

"Digital Signatures Authenticate Documents Securely"

### Question 4(a) [3 marks]

What is Hacking? List out types of Hackers.

#### Solution

**Hacking Definition:** Unauthorized access to computer systems or networks to exploit vulnerabilities.

**Hacker Classifications:**

Type	Intent	Legal Status
<b>White Hat</b>	Security improvement	Legal
<b>Black Hat</b>	Malicious activities	Illegal
<b>Gray Hat</b>	Mixed motivations	Questionable

- **White Hat:** Ethical hackers, security researchers
- **Black Hat:** Cybercriminals, malicious intent
- **Gray Hat:** Sometimes legal, sometimes not

#### Mnemonic

“White Good, Black Bad, Gray Questionable”

### Question 4(b) [4 marks]

Explain Vulnerability and 0-Day terminology of Hacking.

#### Solution

##### Security Terminology:

Term	Definition	Risk Level	Example
<b>Vulnerability</b>	System weakness	Varies	Unpatched software
<b>0-Day</b>	Unknown vulnerability	Critical	Undiscovered flaw

##### Vulnerability Characteristics:

- **Discovery:** Found through security testing
- **Disclosure:** Responsible reporting to vendors
- **Patching:** Vendor provides security updates
- **Window:** Time between discovery and patch

##### 0-Day Attack Process:

- Hacker discovers unknown vulnerability
- Exploits flaw before vendor awareness
- No available patches or defenses
- High success rate due to surprise element

##### Protection Strategies:

- Regular security updates
- Intrusion detection systems
- Behavioral analysis tools
- Zero-trust security models

#### Mnemonic

“Vulnerabilities Need Patches, Zero-Days Need Vigilance”

### Question 4(c) [7 marks]

Explain Five Steps of Hacking.

#### Solution

##### Hacking Methodology:

##### Detailed Steps:

Step	Description	Tools/Methods	Objective
<b>Reconnaissance</b>	Information gathering	Google dorking, Social media	Target profiling
<b>Scanning</b>	System enumeration	Nmap, Nessus	Vulnerability identification

<b>Gaining Access</b>	Exploit vulnerabilities	Metasploit, Custom exploits	System compromise
<b>Maintaining Access</b>	Persistent presence	Backdoors, Rootkits	Long-term control
<b>Covering Tracks</b>	Evidence removal	Log cleaning, File deletion	Avoid detection

#### Information Gathering Types:

- **Passive:** No direct target contact
- **Active:** Direct interaction with target systems

#### Scanning Techniques:

- Port scanning for open services
- Vulnerability scanning for weaknesses
- Network mapping for topology

#### Access Methods:

- Password attacks (brute force, dictionary)
- Exploit vulnerabilities
- Social engineering
- Physical access

#### Persistence Mechanisms:

- Installing backdoors
- Creating user accounts
- Scheduling tasks
- Registry modifications

#### Track Covering Methods:

- Clearing system logs
- Deleting temporary files
- Modifying timestamps
- Using encryption

#### Mnemonic

“Reconnaissance Scans Generate Access, Maintain Coverage”

### Question 4(a OR) [3 marks]

Explain any three basic commands of Kali Linux with suitable example.

#### Solution

##### Essential Kali Linux Commands:

Command	Function	Example
<b>nmap</b>	Network scanning	<code>nmap -sS 192.168.1.1</code>
<b>netcat</b>	Network communication	<code>nc -l -p 1234</code>
<b>hydra</b>	Password cracking	<code>hydra -l admin -P passwords.txt ssh://target</code>

- **Nmap:** Discovers hosts and services on network
- **Netcat:** Creates network connections for data transfer
- **Hydra:** Performs brute-force password attacks

#### Mnemonic

“Network Map, Connect, Crack”

### Question 4(b OR) [4 marks]

Describe Session Hijacking in detail.

## Solution

**Session Hijacking Overview:** Attack where attacker takes over legitimate user's session.

**Types of Session Hijacking:**

Type	Method	Prevention
Active	Takes over session	Strong session management
Passive	Monitors session	Encryption (HTTPS)
Network-level	TCP hijacking	Secure protocols
Application-level	Cookie theft	Secure cookie attributes

**Attack Process:**

1. Monitor network traffic
2. Capture session identifiers
3. Replay session tokens
4. Access user account

**Prevention Measures:**

- Use HTTPS for all communications
- Implement secure session management
- Set secure cookie attributes
- Monitor for suspicious activity

## Mnemonic

“Sessions Hijacked Need Secure Handling”

## Question 4(c OR) [7 marks]

Explain how Virtual Private Networks (VPNs) create secure, encrypted connections over public networks.

## Solution

**VPN Architecture:**

**VPN Components:**

Component	Function	Benefit
Tunneling	Creates secure pathway	Data protection
Encryption	Scrambles data	Confidentiality
Authentication	Verifies identity	Access control
IP Masking	Hides real IP	Anonymity

### VPN Protocols:

Protocol	Security Level	Speed	Use Case
<b>OpenVPN</b>	High	Good	General purpose
<b>IPSec</b>	Very High	Moderate	Enterprise
<b>WireGuard</b>	High	Excellent	Modern solution
<b>PPTP</b>	Low	Fast	Legacy (deprecated)

### VPN Working Process:

1. **Connection:** Client connects to VPN server
2. **Authentication:** User credentials verified
3. **Tunnel Creation:** Encrypted pathway established
4. **Data Encryption:** All traffic encrypted
5. **Routing:** Traffic routed through VPN server
6. **Decryption:** Data decrypted at destination

### Security Benefits:

- **Data Protection:** Encryption prevents eavesdropping
- **Privacy:** IP address masking
- **Access Control:** Authenticate before connection
- **Bypass Restrictions:** Access geo-blocked content

### Business Applications:

- Remote worker access
- Site-to-site connectivity
- Secure cloud access
- Compliance requirements

### Personal Use Cases:

- Public Wi-Fi protection
- Privacy enhancement
- Content access
- Location privacy

### Mnemonic

“VPNs Provide Network Privacy”

## Question 5(a) [3 marks]

Explain Network forensics.

### Solution

**Network Forensics Definition:** Investigation of network traffic to detect and analyze security incidents.

### Key Components:

Component	Purpose	Tools
<b>Traffic Capture</b>	Record network data	Wireshark, tcpdump
<b>Analysis</b>	Examine patterns	NetworkMiner, Snort
<b>Evidence</b>	Document findings	Forensic reports

- **Scope:** Analyzes packets, flows, and network behavior
- **Objective:** Identify security breaches and attack patterns
- **Challenge:** Large data volumes and real-time processing

### Mnemonic

“Network Forensics Finds Facts”

Question 5(b) [4 marks]

Explain why CCTV plays an important role as evidence in digital forensics investigations.

Solution

CCTV in Digital Forensics:

Aspect	Importance	Value
Visual Evidence	Direct observation	High credibility
Timeline	Time-stamped records	Event correlation
Digital Format	Easy to analyze	Metadata extraction
Backup	Multiple copies	Evidence preservation

Evidence Value:

- **Corroboration:** Supports other digital evidence
- **Timeline:** Establishes sequence of events
- **Identity:** May reveal perpetrator identity
- **Context:** Shows physical environment during incident

Forensic Considerations:

- **Chain of Custody:** Proper evidence handling
- **Authentication:** Verify video integrity
- **Analysis:** Enhancement and interpretation
- **Legal Admissibility:** Court-acceptable format

Mnemonic

“CCTV Captures Criminal Conduct Clearly”

Question 5(c) [7 marks]

Explain phases of Digital forensic investigation.

Solution

Digital Forensics Investigation Phases:  
Detailed Phase Breakdown:

Phase	Activities	Tools	Objective
Identification	Recognize potential evidence	Visual inspection	Scope definition
Preservation	Prevent evidence contamination	Write blockers	Evidence integrity
Collection	Acquire digital evidence	Forensic imaging	Complete data capture
Examination	Extract relevant data	Autopsy, FTK	Data recovery
Analysis	Interpret findings	Timeline tools	Pattern identification
Presentation	Document results	Report generators	Legal presentation

**Phase 1 - Identification:**

- Survey the scene
- Identify potential evidence sources
- Document initial observations
- Establish investigation scope

**Phase 2 - Preservation:**

- Secure the crime scene
- Prevent evidence contamination
- Use write-protection mechanisms
- Document evidence condition

**Phase 3 - Collection:**

- Create forensic images
- Maintain chain of custody
- Use proper collection techniques
- Generate hash values for verification

**Phase 4 - Examination:**

- Extract file systems
- Recover deleted data
- Identify relevant files
- Document findings

**Phase 5 - Analysis:**

- Correlate evidence
- Reconstruct events
- Identify patterns
- Form conclusions

**Phase 6 - Presentation:**

- Prepare detailed reports
- Create visual presentations
- Explain technical findings
- Support legal proceedings

**Quality Assurance:**

- **Documentation:** Detailed records at each phase
- **Validation:** Verify procedures and results
- **Reproducibility:** Ensure results can be replicated
- **Legal Compliance:** Follow jurisdictional requirements

**Mnemonic**

“Investigators Preserve, Collect, Examine, Analyze, Present”

**Question 5(a OR) [3 marks]**

List applications of microcontrollers in various fields related to cybersecurity.

**Solution****Microcontroller Security Applications:**

Field	Application	Security Function
<b>IoT Security</b>	Smart home devices	Authentication, encryption
<b>Access Control</b>	Key cards, biometric	Identity verification
<b>Network Security</b>	Hardware firewalls	Packet filtering

- **Smart Cards:** Secure authentication tokens
- **HSM (Hardware Security Modules):** Cryptographic processing
- **Embedded Systems:** Secure boot, tamper detection

**Mnemonic**

“Microcontrollers Manage Multiple Security Functions”

### Question 5(b OR) [4 marks]

Explain the importance of port scanning in ethical hacking.

#### Solution

##### Port Scanning in Ethical Hacking:

Aspect	Importance	Benefit
Service Discovery	Identify running services	Attack surface mapping
Vulnerability Assessment	Find open ports	Security gap identification
Network Mapping	Understand topology	Infrastructure analysis
Security Testing	Validate configurations	Compliance verification

##### Port Scanning Techniques:

- **TCP Connect:** Full connection establishment
- **SYN Scan:** Stealth scanning method
- **UDP Scan:** User Datagram Protocol scanning
- **Service Detection:** Identify service versions

##### Ethical Considerations:

- **Authorization:** Obtain proper permissions
- **Scope:** Stay within defined boundaries
- **Documentation:** Record all activities
- **Reporting:** Provide detailed findings

#### Mnemonic

“Port Scanning Provides Security Insights”

### Question 5(c OR) [7 marks]

Describe the process of conducting a vulnerability assessment using Kali Linux tools.

#### Solution

##### Vulnerability Assessment Process:

##### Kali Linux Tools and Commands:

##### Step-by-Step Process:

Step	Kali Tool	Command Example	Purpose
Reconnaissance	Nmap	<code>nmap -sn 192.168.1.0/24</code>	Host discovery
Port Scanning	Nmap	<code>nmap -sS -O target</code>	Open port identification
Service Enumeration	Nmap, Banner grabbing	<code>nmap -sV target</code>	Service version detection
Vulnerability Scanning	OpenVAS, Nessus	<code>openvas-start</code>	Automated vulnerability detection
Web Application Testing	Nikto, Dirb	<code>nikto -h target</code>	Web vulnerability scanning



### Detailed Process:

#### Phase 1 - Target Identification:

- Use Nmap for network discovery
- Identify live hosts and their IP addresses
- Document network topology
- Determine target scope

#### Phase 2 - Port and Service Analysis:

- Perform comprehensive port scans
- Identify running services and versions
- Check for default credentials
- Analyze service configurations

#### Phase 3 - Automated Vulnerability Scanning:

- Configure vulnerability scanners (OpenVAS)
- Run comprehensive scans
- Analyze scan results
- Prioritize findings by severity

#### Phase 4 - Manual Testing:

- Verify automated findings
- Perform targeted testing
- Test for specific vulnerabilities
- Validate false positives

#### Phase 5 - Web Application Assessment:

- Use web vulnerability scanners
- Test for OWASP Top 10 vulnerabilities
- Analyze application logic
- Check for misconfigurations

#### Common Kali Tools:

Tool	Function	Use Case
Nmap	Network scanning	Port and service discovery
OpenVAS	Vulnerability scanning	Automated assessment
Nikto	Web scanning	Web server vulnerabilities
Dirb	Directory brute forcing	Hidden file discovery
SQLmap	SQL injection testing	Database vulnerabilities
Burp Suite	Web proxy	Manual web testing
Metasploit	Exploitation framework	Vulnerability validation

#### Assessment Methodology:

- **Scope Definition:** Clearly define assessment boundaries
- **Information Gathering:** Collect target intelligence
- **Vulnerability Detection:** Use multiple scanning methods
- **Risk Assessment:** Evaluate impact and likelihood
- **Remediation Planning:** Provide actionable recommendations

#### Reporting Components:

- **Executive Summary:** High-level findings for management
- **Technical Details:** Detailed vulnerability descriptions
- **Risk Ratings:** CVSS scores and business impact
- **Remediation Steps:** Specific mitigation recommendations
- **Supporting Evidence:** Screenshots and proof-of-concept

#### Best Practices:

- **Authorization:** Always obtain written permission
- **Documentation:** Maintain detailed logs of all activities
- **Minimal Impact:** Avoid disrupting production systems
- **Confidentiality:** Protect sensitive information discovered

### Mnemonic

“Vulnerability Assessment Validates Application Security”