CBI Assistant Programmer 2025 - Computer Networks Notes & MCQs

1. Goals and Applications of Networks

Computer networks connect devices for communication, resource sharing, and information exchange.

Applications include file sharing, email, VoIP, e-commerce, remote access, etc.

2. LAN, MAN, WAN and Subnet Concepts

LAN: Local Area Network - small geographical area (e.g., office).

MAN: Metropolitan Area Network - spans a city.

WAN: Wide Area Network - connects geographically separated LANs (e.g., Internet).

WAN Subnet: Logical subdivision used to efficiently route data.

3. OSI and TCP/IP Models

OSI Model has 7 layers: Physical, Data Link, Network, Transport, Session, Presentation, Application.

TCP/IP has 4 layers: Link, Internet, Transport, Application.

TCP/IP is used in real-world networks; OSI is a theoretical model.

4. Internetworking & Routing

Internetworking connects multiple networks via routers.

Connection-oriented (TCP) vs connectionless (IP, UDP).

Autonomous System (AS): Group of networks under one admin domain.

Routing protocols: OSPF (Interior), BGP (Exterior).

5. IP Addressing & Subnetting

Class A: 0.0.0.0 - 127.255.255.255 (/8)

Class B: 128.0.0.0 - 191.255.255.255 (/16)

Class C: 192.0.0.0 - 223.255.255.255 (/24)

Subnetting divides a network for better management.

Formula: Hosts/subnet = 2^h - 2.

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6. IP Protocol Details

IP is connectionless and unreliable.

MTU: Max size of IP packet allowed.

Fragmentation: Splits large packets.

Reassembly: Performed at the destination.

7. Internet Control Protocols (ICMP, ARP, RARP)

ICMP: Sends error messages (e.g., ping).

ARP: IP-to-MAC resolution.

RARP: MAC-to-IP (obsolete, replaced by DHCP).

8. Transport Layer - UDP vs TCP

UDP: Unreliable, fast, connectionless (used in DNS, VoIP).

TCP: Reliable, ordered, uses handshakes and acknowledgements (used in HTTP, FTP).

9. Socket Programming & Byte Order

Sockets enable network communication in programs.

TCP: Uses listen(), accept(), send(), recv().

UDP: Uses sendto(), recvfrom().

Network Byte Order: Big Endian. Use htons(), ntohs(), etc.

10. Firewalls and Encryption

Firewalls filter traffic: Packet-filter, Stateful, Application layer.

Encryption:

- Symmetric (AES, DES)

- Asymmetric (RSA)

- Hashing (SHA, MD5)

Encryption ensures confidentiality, integrity, and authenticity.

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11. Sample MCQs (PYQ Style)

1. What is the purpose of the ARP protocol?

A) Encrypt data

B) Resolve IP to MAC address

C) Resolve MAC to IP address

D) Route data

Answer: B

2. Which protocol is used for reliable connection-oriented transmission?

A) UDP

B) IP

C) TCP

D) ICMP

Answer: C

3. The OSI model contains how many layers?

A) 5

B) 7

C) 4

D) 6

Answer: B

4. Which protocol is used for inter-AS routing?

A) OSPF

B) RIP

C) BGP

D) ARP

Answer: C

5. Which encryption standard uses a public and private key pair?

A) AES

B) DES

C) RSA

D) SHA-1

Answer: C