

# Computer Network

Me lol

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## Notes

- PYQs of BEX's CT657, BEI's CT613 and BCT's CT702 are combined.
- BEX's and BCT's are kept with normal font.
- BEI's are kept with `this styling` to differentiate.

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# 1 Introduction to Computer Network

(5 Hours/8 Marks)

## 1.1 Computer Network & Uses

1. What are the applications of computer networks? [2] (76 Ba)
2. What is computer network? [1] (76 Ba) [2] (71 Shr)
3. What are the advantages of computer network? [3] (72 Ma)
4. Explain five instances of how networks are a part of your life today. [5] (**72 Ch**)

## 1.2 Networking model: client/server, P2P, active network

1. Discuss Client-Server model and Peer-to-Peer model. [4] (81 Ba)
2. How does client-server model work? [3] (73 Ma)
3. What are the features of Client/Server Architecture? [4] (70 Ch, 76 Ash)
4. Draw the architecture for Client/Server network model. [2] (**75 Ch**)
5. Explain briefly the architecture for peer-to-peer network model with example. [3] (**77 Ch**)  
|→How does P2P works? Explain. [6] (**80 Bh**)  
|→Explain in details about P2P network model with supportive examples. [6] (**75 Ch**)
6. Distinguish between Client-Server network and Peer-Peer network. [3] (**74 Ch**) [5] (73 Ma)

## 1.3 Network Software, Protocols and Standards

1. Define protocol. [1] (**76 Ch,72 Ash**) [4] (bo79 Ch)
2. Explain about connection oriented and connection less service. [3] (**71 Bh**)
3. Mention service primitives for implementing connection oriented service. [2] (75 Ash)
4. What do you mean by network architecture? [2] (**71 Ch**)
5. Why do you need layering? [2] (**80 Bh**)
6. Why do we need layered protocol architecture? [2] (**72 Ash**)
7. What are the reasons for using layered network architecture? [2] (**76 Ch**) [3] (**73 Ch**, 75 Ba)
8. Why layering is important? [2] (**79 Bh**, 75 Ash) [4] (**73 Bh**)
9. What are the layer design issues? [3] (**71 Bh**)
10. Explain design issues for layers in detail. [4] (75 Ash)
11. Explain about the design issues of Computer Network software. [5] (**74 Bh**)

## 1.4 OSI model and TCP/IP model

1. Explain Open System Interconnection (OSI) model. [5] (**74 Ch**, 71 Ma)  
|→Explain OSI reference model with suitable diagram. [6] (80 Ba)  
|→Explain the different layers of OSI reference Model with appropriate figure. [5] (**76 Bh**)
2. What is the significance of OSI layer? [2] (74 Ash)  
|→What are the reasons for using layered protocol? [3] (75 Bh)
3. Explain in which level of OSI layer following tasks are done. [3] (**72 Ch**)  
(i) Error detection and correction (ii) Encryption and Decryption of data  
(iii) Logical identification of computer (iv) Point-to-point connection of socket  
(v) Dialogue control (vi) Physical identification of computer
4. Explain each layer of TCP/IP protocols architecture in detail. [5] (**72 Ash**)
5. List out the functions of physical lapyer in TCP/IP reference model. [2] (72 Ka)

6. Distinguish between physical channel and physical layer. [3] (**74 Bh**)

## 1.5 Comparison of OSI and TCP/IP model

1. Differentiate between TCP/IP and OSI Model.  
[3] (**76 Bh, 71 Ch**, 71 Ma) [4] (81 Ba) [5] (**77 Ch, 76 Ch, 72 Ch**, 76 Ba, 75 Ba, 73 Shr, 72 Ma) [6] (71 Shr)  
|→ Explain OSI model and compare OSI with TCP/IP reference model. [6] (**79 Bh**)
2. How do you differentiate OSI's network and transport layer with TCP/IP's Network and transport layer? [4] (**79 Ch**)

## 1.6 Data Encapsulation

1. What is data encapsulation? [2] (**80 Ba**)
2. How the process of data encapsulation occurs in transmission mode described by seven layers of OSI model. [5] (**75 Bh**)
3. What are headers and trailers and how do they get added and removed?  
[4] (76 Ash, 70 Ch) [5] (**73 Ch**)

## 1.7 Example network: The Internet, X.25, Frame Relay, Ethernet, VoIP, NGN and MPLS, xDSL

1. Explain X.25 Network with its key feature. [3] (**71 Ch**)
2. Define Frame Relay in detail. [3] (73 Shr)
3. What is Internet work? [2] (**71 Bh**)
4. Explain the function of following of following devices in brief: [6] (**73 Bh**)  
(i) Hub (ii) Bridge (iii) Router
5. You are assigned to design a network infrastructure for a 3-star hotel. Recommend a network solution with hardwares and softwares in current trend that can be used in the hotel. Make necessary assumptions and justify your recommendation with logical arguments where possible. [8] (72 Ka)

## 2 Physical Layer

(5 Hours/8 Marks)

### 2.1 Network monitoring: delay, latency, throughput

1. Define:
  - |→ Delay [1] (**80 Bh**, 80 Ba)
  - |→ Bandwidth [1] (**80 Bh**, **76 Bh**)
  - |→ MAC address [1] **80 Bh**
  - |→ Throughput [1] (**76 Bh**, 80 Ba, 76 Ba)
  - |→ Latency [1] (76 Ba)
2. What are the causes of packet delay? [2] (**76 Bh**)

### 2.2 Transmission media: Twisted pair, Coaxial, Fiber optic, Line-of-site, Satellite

1. What is transmission medium? [1] (**76 Ch**, **71 Bh**) [2] (71 Shr) [3] (**74 Ch**)
2. Write down the transmission medium used for networking. [4] (**72 Ash**)
3. Explain different types of transmission media. [6] (72 Ka)
  - |→ Explain about any three transmission media in detail. [6] (71 Shr)
4. What are the factors to be considered while selecting transmission media? [2] (**79 Bh**, 81 Ba)
5. Explain twisted pair cable with its practical applications. [4] (**77 Ch**)
6. Explain optical fiber cable in detail with its advantages and disadvantages. [6] (81 Ba)
7. Explain different transmission medium with their merits and demerits. [6] (**76 Ch**)
8. Explain the characteristics of twisted pair, coaxial and optical fiber cable. [6] (76 Ba)
9. Explain about any two guided transmission media in detail. [6] (74 Ash)
10. List guided and unguided media used in computer network. [2] (73 Ma)
11. Explain Ethernet cable standards. [6] (73 Ma)
12. Compare different types of guided transmission media with appropriate figures. [6] (80 Ba)
13. Differentiate between wired and wireless media with their benefits and drawbacks. [3] (75 Ba)
14. Compare among Twisted Pair, Coaxial cable and Fiber optic. [5] (**74 Ch**)
15. Why, now a day all communication media like twisted pair, co-axial pair even wireless media are replaced by optical fibre? Justify your answer with necessary diagram, working principle and transmission mechanism. [7] (**71 Bh**)
16. Explain various cabling techniques used in IEEE 802.3 standard. [4] (71 Ma)

### 2.3 Multiplexing, Circuit switching, Packet switching, VC Switching, Telecommunication switching system (Networking of Telephone exchanges)

1. What is switching? [1] (**75 Ch**, 74 Ash) [2] (**74 Bh**, 73 Shr) [3] (**75 Bh**)
2. What are the various switching techniques? [2] (**75 Ch**)
  - |→ Explain about various switchings with practical implementation example. [6] (**70 Ch**)
3. What do you mean by data switching? [2] (**70 Ch**)
4. Define multiplexing. [1] (74 Ash)
5. Explain different types of multiplexing used in communication system. [4] (72 Ma)
6. Compare switching with multiplexing. [2] (73 Shr)
7. Elaborate packet switching with a proper diagram. [5] (**75 Ch**)

8. (Assumed) Discuss how data or packets goes through switch to switch in Frame Relay Virtual-circuit network. [5] (**80 Bh**)
9. Differentiate between datagram switching and virtual circuit switching approach. [4] (72 Ma) [6] (**79 Bh**)  
 |→ with suitable diagram. [6] (**74 Bh**)
10. Differentiate between circuit switching and packet switching. [3] (**75 Bh**, 75 Ash) [4] (**77 Ch,76 Bh,72 Ash**)  
 |→ Compare and which would you prefer and why? [2+2] (71 Ma)
11. Discuss Packet and Circuit switching concepts with example. [5] (75 Ba)

## 2.4 ISDN: Architecture, Interface, and Signaling

1. What is ISDN? [2] (**71 Ch**)
2. Explain about the ISDN architecture in detail with example. [6] (**71 Ch**)
3. Why the telephone companies developed ISDN? [2] (76 Ash)
4. Explain the working principle of ISDN with its interface and functional group. [6] (76 Ash)
5. Explain ISDN channels with architecture. [5] (75 Ash)
6. Explain the E1 Telephone hierarchy system. [4] (73 Shr)

## 3 Data Link Layer

(5 Hours/8 Marks)

### 3.1 Functions of Data link layer

1. How does data link apply flow control technique in network communication? Explain with example. [6] (**79 Ch**)
2. What are the services provided by data link layer? [2] (**80 Bh, 79 Bh**) [3] (**77 Ch**)
3. What are the different sub-layers of data link layer? [2] (76 Ba)
4. Explain the functions of each sub-layer. [6] (76 Ba)
5. State the various design issues for the data link layer? [3] (75 Ash)

### 3.2 Framing

1. What do you mean by Framing? [2] (**79 Ch**)
2. Compare Flag byte with byte stuff and bit stuffing in Framing. [2] (81 Ba)
3. Describe the various framing techniques at data link layer. [2] (**75 Ch**) [6] (**75 Ch**)
4. Explain any one method of framing with example. [6] (**75 Ch**)

### 3.3 Error Detection and Corrections

1. How can CRC be used to detect error? [6] (**80 Bh**)
2. Detect the error if any using CRC, if received fram is 0101101101 and generator polynomial is 1001. [6] (81 Ba)
3. Explain Selective repeat and Go back N ARQ with example. [6] (80 Ba)

### 3.4 Flow Control

1. (Assumed) Differentiate between datagram switching and virtual circuit switching approach. [6] (**79 Bh**)
2. What is piggybacking? [3] (75 Ash)

### 3.5 Examples of Data Link Protocol, HDLC, PPP

### 3.6 The Medium Access Sub-layer

1. (Assumed) Through we have MAC address, why do we use IP address to represent the host in networks? Explain your answer. [3] (**72 Ch**)

### 3.7 The channel allocation problem

1. Why do you think that static channel assignment is not efficient? [2] (**73 Ch**)

### 3.8 Multiple Access Protocols

1. What are multiple access protocols? [2] (**76 Bh,75 Ch**)



### 3.9 Ethernet

1. Explain Ethernet frame with function of each field. [5] (77 Ch)

### 3.10 Networks: FDDI, ALOHA, VLAN, CSMA/CD, IEEE 802.3(Ethernet), 802.4(Token Bus), 802.5(Token Ring), and 802.1(Wireless LAN)

1. What is ALOHA system? [2] (79 Ch)  
|→ Explain different types of ALOHA. [4] (75 Ba)
2. How does CSMA-CD works? Explain. [4] (76 Ch) [6] (79 Ch)  
|→ with figure. [8] (76 Ash)
3. Why is CSMA-CD not suitable for wireless medium? Explain. [2] (76 Ch)
4. Explain about operation of Carrier Sense Multiple Access with Collision Detection. [6] (73 Ch)
5. What is collision? How is it occurred? [1+1] (76 Ch)
6. How the possibility of collision is reduced in IEEE 802.3 and IEEE 802.11? Explain. [6] (76 Ch)
7. Differentiate between Token Bus and Token Ring networks. [4] (75 Ba)

### 3.11 Numericals

1. A frame having size of 1000 bits is transmitted through a channel having capacity of 200 KB/Sec. Calculate the percentage of idleness of the channel assuming the round trip time of the channel to be 20ms. Is the channel efficient? What is your recommendation further? [5+1+4] (73 Bh)
2. A bit string 011011101111111011111110 needs to be transmitted with flag 7E at the data link layer. What is the string actually transmitted after bit stuffing? [6] (80 Ba)
3. A bit string 01111011111101111110 needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing? [2] (75 Ash)

## 4 Network Layer

(9 Hours/16 Marks)

### 4.1 Internet working and devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway

### 4.2 Addressing: Internet address, classful address

1. What are IPv4 address classes? [2] (79 Ch)

### 4.3 Subnetting

1. How do you subnetwork a class C network block to following subnets of 41,14,102, and 21 computers respectively? Explain with example. [8] (79 Ch)

### 4.4 Routing: techniques, static vs. dynamic routing , routing table for classful address

### 4.5 Routing Protocols: RIP, OSPF, BGP, Unicast and multicast routing protocols

### 4.6 Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP

## 5 Transport Layer

(5 Hours/8 Marks)

- 5.1 The transport service: Services provided to the upper layers
- 5.2 Transport protocols: UDP, TCP
- 5.3 Port and Socket
- 5.4 Connection establishment, Connection release
- 5.5 Flow control and buffering
- 5.6 Multiplexing and de-multiplexing
- 5.7 Congestion control algorithm: Token Bucket and Leaky Bucket Transport Layer

## 6 Application Layer

(5 Hours/8 Marks)

- 6.1 Web: HTTP and HTTPS
- 6.2 File Transfer: FTP, PuTTY, WinSCP
- 6.3 Electronic Mail: SMTP, POP3, IMAP
- 6.4 DNS
- 6.5 P2P Applications
- 6.6 Socket Programming
- 6.7 Application server concept proxy caching, Web/Mail/DNS server optimization
- 6.8 Concept of traffic analyzer: MRTG, PRTG, SNMP, Packet tracer, Wireshark.

## 7 Introduction to IPV6

(4 Hours/8 Marks)

7.1 IPv6- Advantages

7.2 Packet formats

7.3 Extension headers

7.4 Transition from IPv4 to IPv6: Dual stack, Tunneling, Header Translation

7.5 Multicasting

## 8 Network Security

(7 Hours/16 Marks)

- 8.1 Properties of secure communication
- 8.2 Principles of cryptography: Symmetric Key and Public Key
- 8.3 RSA Algorithm
- 8.4 Digital Signatures
- 8.5 Securing e-mail (PGP)
- 8.6 Securing TCP connections (SSL)
- 8.7 Network layer security (IPsec, VPN)
- 8.8 Securing wireless LANs (WEP)
- 8.9 Firewalls: Application Gateway and Packet Filtering, and IDS