

Computer Network

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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, 71 Sh**) [3] (**77 Ch, 72 Ka**) [4] (**74 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**)
|→Explain about framing in detail. [5] (71 Sh)
2. Compare Flag byte with byte stuff and bit stuffing in Framing. [2] (81 Ba) [3] (**73 Ch**)
3. Describe the various framing techniques at data link layer. [2] (**75 Ch**) [6] (**75 Ch**)
4. What are the methodologies used in data framing? [4] (**72 Ash**)
5. How a complete link is established during the dialup connection? Explain. [4] (**72 Ash**)
6. 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)
4. Explain difference between Error Correcting and Error detection process? [5] (**70 Ch**)
5. Write down the importance of error detection and correction bits. [3] (72 ma)

3.4 Flow Control

1. (Assumed) Differentiate between datagram switching and virtual circuit switching approach. [4] (**74 Ch**) [6] (**79 Bh, 74 Ash**)
2. What is piggybacking? [3] (75 Ash)
3. (Assumed) What are the causes of packet delay in computer networks? [2] (74 Ash)

3.5 Examples of Data Link Protocol, HDLC, PPP

1. What is PPP? [2] (73 Ch)

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**)
2. Why do you think that the issues of media access is very important in data link layer? [3] (**74 Bh**)

3.7 The channel allocation problem

1. Why do you think that static channel assignment is not efficient? [2] (73 Ch)
2. Explain the channel allocation problem with example. [5] (72 Ka)

3.8 Multiple Access Protocols

1. What are multiple access protocols? [2] (76 Bh,75 Ch,71 Ch)
2. Explain how multiple access is achieved in IEEE 802.5. [6] (71 Ch)
3. What are multiple access protocols? What is its significance in data link layer? Explain why token bus is also called as the token ring. [2+2+4] (76 Bh,75 Ch,73 Sh)

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, 72 Ma)
|→ What is pure ALOHA and slotted ALOHA? Consider the delay of both at low load. Which one is less. [3+2] (71 Bh)
2. How does CSMA-CD work? Explain. [4] (76 Ch) [6] (79 Ch)
|→ with figure. [8] (76 Ash)
3. Explain about the operation of CSMA/CD. [3] (74 Bh)
4. How can you make it more efficient? [5] (74 Bh)
5. Why is CSMA-CD not suitable for wireless medium? Explain. [2] (76 Ch)
6. Explain Carrier sense multiple access with collision detection (CSMA/CD) is better than CSMA? [5] (71 Ma)
7. Explain about operation of Carrier Sense Multiple Access with Collision Detection. [6] (73 Ch)
8. What is collision? How is it occurred? [1+1] (76 Ch)
9. How the possibility of collision is reduced in IEEE 802.3 and IEEE 802.11? Explain. [6] (76 Ch)
10. Differentiate between Token Bus and Token Ring networks. [4] (75 Ba)
11. List the features of FDDI. [4] (72 Ch)
12. Explain fault tolerance mechanism of FDDI. [3] (73 Ch)
13. Explain IEEE 802.4. [3] (71 Ma)

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] (73 Ch)
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. A bit string 0111101111101111110 needs to be transmitted at the data link layer what is string actually transmitted at the data link layer what is string actually transmitted after bit stuffing, if flag patterns is 01111110. [3] (**70 Ch**)

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