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`.

Contents

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-start 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

<div align="center">(5 Hours/8 Marks)</div>

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**)

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)

3.3 Error Detection and Corrections

1. Detect the error if any using CRC, if received fram is 0101101101 and generator polynomial is 1001. [6] (81 Ba)

3.4 Flow Control

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

3.9 Ethernet

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**)
2. How does CSMA-CD works? Explain. [6] (**79 Ch**)
3. Explain about operation of Carrier Sense Multiple Access with Collision Detection. [6] (**73 Ch**)

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**)

4   Network Layer

<div align="center">(9 Hours/16 Marks)</div>

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

<center>(5 Hours/8 Marks)</center>

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 P2PApplications

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

<div align="center">(4 Hours/8 Marks)</div>

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

<center>(7 Hours/16 Marks)</center>

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