Computer Network

Me lol
Bhushan Nepal

August 5, 2025

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

(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**) [5] (**69 Bh**) [6] (**75 Ch**)
4. What are the methodologies used in data framing?   [4] (**72 Ash**) [6] (70 Asa)
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)
6. Describe Cyclic Redundancy Check with example.   [5] (70 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)
4. What are the difference between error control and flow control?   [3] (70 Ma)
5. Explain different types of flow control mechanism in data link layer.   [8] (**70 Bh**)
6. (Assumed) Define switching and multiplexing.   [4] (**69 Ch**)
7. Differentiate between circuit switching and packet switching.   [4] (**69 Ch**) [5] (**69 Bh**)

3.5 Examples of Data Link Protocol, HDLC, PPP

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

2. Write short notes on: HDLC   [4] (73 Shr)

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 acheived 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**)
4. What are the functions of LLC and MAC sub-layer? [2+2] (70 Asa)

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 works? 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 collission? How is it occured? [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 01101110111111111011111110 needs to be transmitted with flag 7E at the data linnk layer. What is the string actually transmitted after bit stuffing? [6] (`80` Ba) [3] (**73 Ch**)

3. A bit string 0111101111101111110 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 0111101111011111110 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

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

1. What are the functions of network layer? [2] (72 Ka)
2. Network layer is one of the key layers in OSI reference model, why? [2] (72 Ka)

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

1. Write short notes on: HUB, Switch, Routers. [4] (75 ba)
2. Compare and contrast betweeen Hub, Switch, Bridge and Router. [8] (71 Ma)
   |→also repeater. [8] (**70 Ch**)
3. What are the interconnecting devices used for networking, explain in brief. [8] (**72 Ash**)

4.2 Addressing: Internet address, classful address

1. What is phyiscal address? [2] (73 Ma)
2. Write short notes on IP. [4] (71 Shr)
3. What are the mechanisms adapted for optimization of uses of IP address. [4] (**73 Bh**)
4. What are IPv4 address classes? [2] (**79 Ch**)
5. What is classful and classless address? [2] (74 Ash)
6. Why do we think that there arised the need of classless IP address through class based IP address was in use? [4] (**73 Ch**)
7. Show the classless IP with an example. [4] (**73 Ch**)
8. What is the Network address and broadcast address in IPv4 addressing? [2] (81 Ba)
9. What is private IP address? [2] (**80 Bh**,**75 Bh**)
10. What is the purpose of Time to live (TTL) and protocol field in header of IPv4 datagram. [4] (**76 Ch**)
11. Write short notes on ARP. [4] (71 Shr)

4.3 Subnetting

1. Explain with exampele, the use of sub-netting showing network address, broadcast address and sub-net mask. [6] (**73 Bh**)

2. What is subnet mask? [1] (71 Ma)

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

1. What is routing? [1] (**77 Ch**, 76 Ba) [2] (76 Ash, 71 Shr, 70 Ma)
2. Why routing is essential in computer networking? [3] (75 Ash)
   |→Explain importance of routing in computer networking? [2] (73 Ma)
3. What are the criteria for good routing? [2] (**74 Ch**, 81 Ba)
4. What is static and dynamic routing? [3] (76 Ba)
5. What is dynamic routing? [1] (**71 Bh**)
6. Why do we use dynamic routing? [2] (**75 Bh**)
7. What is the difference between routed and routing protocol? [2] (**79 Ch**)
8. What is routed and routing protocol? Give examples. [4] (**72 Ch**)

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

1. Explain the general operation of RIP with timers. [6] (81 Ba)
2. Explain RIP, OSPF, BGP, IGRP and EIGRP. [6] (**74 Ch**)
3. Explain the working process of OSPF with an example. [6] (**70 Bh**)
4. Explain BGP protocol and clarify how routing works in the internet. [6] (70 Ma)
5. What do you mean by autonomous system? [2] (**75 Ch**)
6. Why are different inter-AS and intra-AS protocols used in the internet? [2] (80 Ba)
7. How does link state unicast routing work? Explain. [8] (**79 Ch**)
8. What is link state routing? [2] (**70 Bh**)
9. Explain the operation of Link State Routing Protocol. [5] (75 Ba)
10. Define unicast and multicast routing. [2] (**79 Bh**)
11. Briefly explain about multicast routing protocols and unicast routing protocols. [6] (72 Ka)
12. Which protocol is used in internet layer to provide feedback to hosts/routers about the problems in network environment? [1] (**76 Ch**)

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

1. Describe flooding technique with its characteristics. [4] (**77 Ch**)
2. Explain algorithm with ways to minimize the duplication of packets. [4] (**80 Bh**)
3. Write down steps for Link State Routing Protocol. [4] (**80 Bh**)
4. Difference between link state and distance vector routing algorithms.
   [3] (**77 Ch**,**76 Bh**) [4] (76 Ba) [6] (81 Ba, 76 Ash, 74 Ash, 72 Ka, 71 Shr)
   |→with example. [6] (**79 Bh**)
   |→Compare working. [5] (75 Ash)
5. How routing loops are prevented in distance vector routing? Explain with examples.
   [5] (**76 Bh**) [6] (**75 Ch**)
   |→Explain with example how distance vector routing is used to route the packet and why count-to-infinity problem arises and how does it get solved. [6] (**75 Bh**)
6. What is count to infinity problem? [2] (**71 Bh**)
7. Explain how distance vector routing algorithm operates dynamically? [6] (73 Ma)
   |→What is its problem? [2] (73 Ma)
8. Write short notes on: Distance vector routing. [4] (**73 Bh**) [5] (**71 Bh**)
9. What is ARP and how does it work? [3] (**76 Ch**)
10. Write short notes on ARP. [4] (71 Shr)
11. Explain the following terminologies: Network Layer, Shortest Path Routing algorithm, link State Routing Protocol, Interior Gateway Routing protocol, ICMP. [8] (72 Ma)
12. Write short notes on ICMP. [4] (71 Shr)
13. A large number of consecutive IP addresses are available at 202.70.64.0/19. Suppose that four organization A, B, C and D request 100, 500, 800 and 400 addresses respectively, how the subnetting can be performed so, that address wastage will be minimum? [8] (70 Ma)

4.7 Numericals

1. Company Allegro hired an IT expert. The expert was given task to perform logical design of the company with an IP block of 206.100.100.0/24. The company had 40,20,8,100 and 5 employees

in its sales, admin, finance, support and HR departments respectively. Show how he was able to perform subnetting with minimum IP wastage. [6] (**80 Bh**)

2. Design a network for a company having 5 departments with 60, 42, 30, 10 and 12 hosts. Specifiy the network address, valid host range, broadcast address and subnet mask for each department from the given address 207.17.11.0/24. [10] (**80 Ba**)

3. 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. Suppose an ISP has 200, 250, 500 and 100 customers in the four different places say, A, B, C and D and need fourr point-to-point links. Provided an IP 10.0.48.0/21, you are required to perform subnetting with minimum waste of IP. Find out the subnet masks, network address, broadcast address, usable IP range and unusable IP range for each location. [10] (**79 Bh**)

5. Perform the subnetting of IP address block 194.53.0.0/24 for six different departments having 2, 62, 120, 5, 14 and 16 hosts. List out the subnet mask, network address, broadcast address, useable host ranges and wasted IP addresses in each subnet. [8] (**77 Ch**)

6. How do you assign the sub-net IP addresses to three LANs each 12, 5 and 29 computers respectively? (Assume 202.35.91.32/25) [6] (81 Ba)

7. Suppose your company has leased the IP address of 222.70.94.0/24 from your ISP. Divide it far five different departments containing 50, 30, 25, 12, 10 no of hosts. Therefore are also two points to point links far Interconnection between routers. List out the network address, broadcast address, usable IP address range and subnet mask for each subnet. Also mention the unused range of IP addresses. [8] (**76 Ch**)

8. IOE has six departments having 16, 32, 61, 8, 6 and 24 computers. Use 192.168.1.0/24 to distribute the network. Find the network address, broadcast address, usable IP range and subnet mask in each department. [8] (76 Ash)

9. company has four departments having 20, 32, 60 and 24 computers in their respective departments. Assume an IPv4 class C public network address and design IP address blocks for each department from the assumed IP network using VLSM. Include network address, broadcast address, usable IP range and subnet mask for each of the subnet. [8] (**76 Bh**)

10. Suppose you are given the IP address block of 202.101.8.0/24 from your ISP. How can you divide this IP address for four different departments of your organization requiring 50, 10, 25, 100 number of hosts with minimal waste of IP address, in each department? List out the subnet mask, network address, broadcast address and usable host addresses for each subnet. [8] (76 Ba)

11. Suppose you are a private consultant hired by the large company to setup the network for their enterprise and you are given a large number of consecutive. UP address starting at 120.89.96.0/19. Suppose that four departments A, B, C and D request 100, 500, 800 and 400 address respectively, how the subnetting can be performed so, that adress wastage will be minimum? [8] (**75 Ba**)

12. Design a network for 5 departments containing 29, 14, 15, 23 and 5 computers. Take a network example IP 202.83.54.91/25. [8] (75 Ash)

13. You are given an IP address block of 201.40.58.0/24. Perform subnetting for four departments with equal hosts. [6] (**75 Bh**)

14. How can you dedicate 32, 65, 10, 21, 9 public IP address to the departments A, B, C, D and E respectively form the pool of class C IP addresses with minimum loss. Explain. [8] (**74 Ch**)

15. Suppose you are a private consultant hired by a company to setup the network for their enterprise and you are given a large number of consecutive IP address starting at 120.89.96.0/19. Suppose that four departments A, B, C and D request 100, 500, 800 and 400 addresses respectively, how the subnetting can be performed so that address wastage will be minimum? [8] (74 Ash)

16. IOM has 4 colleges. They need to be connected in same network. Allocate following numbers of IP address: 25, 68, 19 and 50 to those colleges by reducing the losses. The IP address provided to you to allocate is 202.61.77.0/24. List the range of IP addresses, their network address, broadcast address and corresponding subnet mask. [8] (**74 Bh**)

17. Suppose we have 4 departments A, B, C and D having 25 hosts, 16 hosts, 29 hosts and 11 hosts respectively. You are given a network 202.70.91.0/24. Perform the subnetting in such a way that the IP address wastage in each department is minimum and find out the subnet mask, network address, broadcast address and usable host range in each department. [8] (**73 Ch**)

18. You are given IP address block 201.40.58.0/24. Design the subnet for 49, 27, 1145 hosts group so that IP address wastage is minimum. Find subnet mask, network ID, broadcast ID, assigned IP and unassigned IP range in each department. [6] (73 Ma)

19. You are a private contractor hired by the large company to setup the network for their enterprise and you are given a large number of consecutive IP address starting at 202.70.64.0/19. Suppose that four department A, B, C and D request 100, 500, 800 and 400 addresses respectively, how the subnetting can be performed so that address wastage will be minimum? [8] (73 Shr)

20. Explain how you can allocate 30, 24, 25 and 20 IP addresses to the four department of ABC company with minimum wastage. Specify the range of IP addresses, Broadcast Address, Network Address and Subnet mask for each department from the given address pool 202.77.19.0/24.
[8] (**72 Ch**)

21. Design IPv4 sub network for an organization having 16, 48, 61, 32 and 24 computers in each departments. Use 192.168.5.0/24 to distribute the network. [8] (72 Ma)

22. Design a network for the Institute of Engineering central campus, Pulchowk having 5 departments having 45, 35, 40, 23 and 30 computers in their respective network by allocating public IP to each computer with minimum losses. Assume IP by yourself. [8] (**72 Ash**)

23. You are given the following address space 10.10.10.0124. You have to assign addresses to 4 departments with the following hosts 5, 16, 23 and 27 respectively. Perform the subnetting in such a way that the IP address wastage in each department are minimum. Also find out the subnet mask, network address, broadcast address and unassigned range in each department.
[10] (**71 Ch**)

24. If there are 5 departments which require 27, 28, 7, 12, 8 hosts respectively, design the subnet with minimum loss of IPs and write the starting and ending address of each subnet. [7] (71 Ma)

25. Given the class C network of 204.15.5.0/24, subnet the network in order to create the network in figure below with the host requirements shown. [8] (**71 Bh**)

netA: 14 hosts
netD: 7 hosts
netC: 2 hosts
netB: 28 hosts
netE: 20 hosts
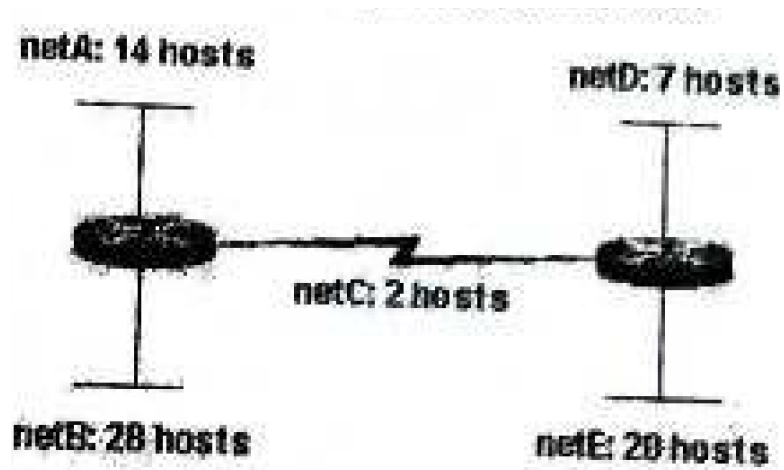
26. How can you dedicate 10, 12, 8, 14 public IP address to department A, B, C and D respectively from the pool of class C with minimum losses of IP? Explain. [8] (**70 Ch**)

27. A large number of consecutive IP addresses are avialable starting at 193.122.2.1. Suppose that four organizations Pulchowk, Thapathali, WRC and ERC request 6000, 2000, 4000 and 2500 address respectively. Design the network and find the first valid IP address, last IP address and mask in w.x.y.z/s notation for each organization. [8] (**70 Bh**)

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

1. What are the factors affecting Congestion?   [3] (75 Ba)

2. Explain Token Bucket algorithm.   [4] (**72 Ch**)

6   Application Layer

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

6.1   Web: HTTP and HTTPS

6.2   File Transfer: FTP, PuTTY, WinSCP

6.3   Electronic Mail: SMTP, POP3, IMAP

1. Compare IMAP and SMTP.   [3] (75 Ba)

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

<center>(4 Hours/8 Marks)</center>

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