VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
-Estd. u/s 3 of UGC Act 1956

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(22CS204) COMPUTER NETWORKS

MODULE BANK -1

1.

a. What advantages does a circuit-switched network have over a packet-switched network? In a circuit-switched network, what advantages does Time-Division Multiplexing (TDM) have over Frequency-Division Multiplexing (FDM)?
b. If end system A wants to send a large file to end system B, describe at a high level how end system A creates packets from the file. When one of these packets arrives at a packet switch, what information in the packet does the switch use to determine the forwarding link? Why is packet switching on the Internet similar to driving from one city to another and asking for directions along the way?
c. Consider a scenario where users share a 2 Mbps link, with each user transmitting continuously at 1 Mbps when active but transmitting only 20% of the time. i) How many users can be supported if circuit switching is used? ii) If packet switching is used, why will there be virtually no queuing delay before the link if two or fewer users transmit simultaneously? Why will there be queuing delays if three users transmit simultaneously?

2.

a. If Host E sends an IP datagram to Host F, will Host E ask router R1 to help forward the datagram? Why? In the Ethernet frame containing the IP datagram, what are the source and destination IP and MAC addresses?
b. With the CSMA/CD protocol, the adapter waits K * 512 bit times after a collision, where K is drawn randomly. For K = 100, how long does the adapter wait before returning to Step 2 for a 10 Mbps broadcast channel? For a 100 Mbps broadcast channel?
c. If nodes A and B are on the same 10 Mbps broadcast channel and the propagation delay between them is 325 bit times, can A finish transmitting a frame before detecting that B has started transmitting? Why or why not? In the worst-case scenario, when does B's signal reach A?

3.

a) Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links of rates R1 = 1500 kbps, R2 = 2 Mbps, and R3 = 1 Mbps.

i. Assuming no other traffic in the network, what is the throughput for the file transfer?

ii. Suppose the file is 4 million bytes. Dividing the file size by the throughput, roughly how long will it take to transfer the file to Host B?

b) What do encapsulation and de-encapsulation mean? Why are they needed in a layered protocol stack?

c) What are some of the possible services that a link-layer protocol can offer to the network layer? Which of these link-layer services have corresponding services in IP? In TCP?

4.

a. If two end systems are connected through multiple routers and the data-link level between them ensures reliable data delivery, is a transport protocol offering reliable data delivery between these two end systems necessary? Why?

b. Analyze the advantages and disadvantages of using a 7-layer model like the OSI compared to a 4-layer model like the TCP/IP.

c. A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is x3+1.

i. What is the actual bit string transmitted?

ii. Suppose the third bit from the left is inverted during transmission. How will receiver detect this error?

5.

a. List six access technologies and classify each one as home access, enterprise access, or wide-area wireless access.

b. Consider sending a packet from a source host to a destination host over a fixed route. Enumerate the components of end-to-end delay. Which of these delays are constant and which are variable?

c. A bit stream 1101011011 is transmitted using the standard CRC method with the generator polynomial x4+x+1x^4 + x + 1x4+x+1. What is the actual bit string transmitted?

6.

a. Suppose the information content of a packet is the bit pattern 1010011101011001 and an even parity scheme is being used. What would be the value of the field containing the parity bits for a two-dimensional parity scheme?

b. Why is an ARP query sent within a broadcast frame? Why is an ARP response sent within a frame with a specific destination MAC address?

c. A bit string 0111101111101111110 needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing?

7.

a. Describe the most popular wireless Internet access technologies today. Compare and contrast them.

b. Consider sending a packet from a source host to a destination host over a fixed route. List the delay components in the end-to-end delay. Which of these delays are constant and which are variable?

c. Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links with rates R1=500R_1 = 500R1=500 kbps, R2=2R_2 = 2R2=2 Mbps, and R3=1R_3 = 1R3=1 Mbps. i. Assuming no other traffic in the network, what is the throughput for the file transfer? (5 Marks) ii. Suppose the file is 4 million bytes. Dividing the file size by the throughput, approximately how long will it take to transfer the file to Host B?

8.

a. What happens when you type a URL in the web browser?

b. Suppose nodes A, B, and C each attach to the same broadcast LAN (through their adapters). If A Sends thousands of IP datagrams to B with each encapsulating frame addressed to the MAC address of B, will C's adapter process these frames? If so, will C's adapter pass the IP datagrams in these frames to the network layer C? How would your answers change if A sends frames with the MAC broadcast address? 7M.

c. Consider the following two-dimensional parity matrix. 5M.

1101

1001

1100

1000

Give an example of a double bit error that can be detected but cannot be corrected.

9.

a. Suppose there is exactly one packet switch between a sending host and a receiving host. The transmission rates between the sending host and the switch, and between the switch and the receiving host are R1R_1R1 and R2R_2R2, respectively. If the switch uses store-and-forward packet switching, what is the total end-to-end delay to send a packet of length LLL? (Ignore queuing, propagation delay, and processing delay.)

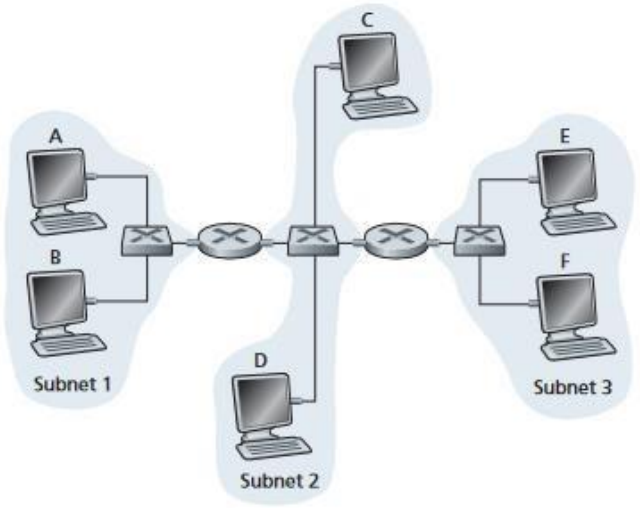
b. Mobile standards such as 1G, 2G, 3G, etc., differ in their transmission rates. What are the typical transmission rates of 3G and 4G?

c. Consider the 7-bit generator G=10011G = 10011G=10011, and suppose that DDD has the value 1010101010. What is the value of RRR?

10.

- **a.** Consider sending a packet from a source host to a destination host over a fixed route. List the delay components in the end–to–end delay. Which of these delays are constant and what are variable?
- **b.** Which layer in the Internet Protocol stack does a router process? Which layers does a link layer switch process? Which layers does a host process?

Consider three LANs interconnected by two routers, as shown in Figure.



i. Assign IP addresses to all the interfaces. For Subnet 1 use addresses of the form 192.168.1.xxx; for Subnet 2 use addresses of the form 192.168.2.xxx; and for Subnet3 use addresses of the form 192.168.3.xxx.

ii. Assign MAC addresses to all the adapters.

iii. Consider sending an IP datagram from Host E to Host B. Suppose all the ARP tables are up to date. Enumerate all the steps, as discussed in class.