COMPUTER NETWORK

Model Test Paper

Question no. 1 is compulsory. Attempt all parts.

Q1. Each question carries equal marks.   (5*5 marks)

A) Difference between Transmission Control Protocol (TCP) and User Datagram Protocol.

Solution:

Transmission Control Protocol (TCP)
1) Transmission Control Protocol (TCP) is a connection oriented protocol, which means the devices should open a connection before transmitting data and should close the connection gracefully after transmitting the data.
2) Transmission Control Protocol (TCP) assures reliable delivery of data to the destination.
3) Transmission Control Protocol (TCP) protocol provides extensive error checking mechanisms such as flow control and acknowledgment of data.
4) Sequencing of data is a feature of Transmission Control Protocol (TCP).
5) Delivery of data is guaranteed if you are using Transmission Control Protocol (TCP).
6) Transmission Control Protocol (TCP) is comparatively slow because of these extensive error checking mechanisms
7) Multiplexing and Demultiplexing is possible in Transmission Control Protocol (TCP) using TCP port numbers.
8) Retransmission of lost packets is possible in Transmission Control Protocol (TCP).

User Datagram Protocol (UDP)
1) User Datagram Protocol (UDP) is Datagram oriented protocol with no overhead for opening a connection (using three-way handshake), maintaining a connection, and closing (terminating) a connection.
2) User Datagram Protocol (UDP) is efficient for broadcast/multicast type of network transmission.
3) User Datagram Protocol (UDP) has only the basic error checking mechanism using checksums.
4) There is no sequencing of data in User Datagram Protocol (UDP). 5) The delivery of data cannot be guaranteed in User Datagram Protocol (UDP).
6) User Datagram Protocol (UDP) is faster, simpler and more efficient than TCP. However, User Datagram Protocol (UDP) it is less robust then TCP
7) Multiplexing and Demultiplexing is possible in User Datagram Protocol (UDP) using UDP port numbers.
8) There is no retransmission of lost packets in User Datagram Protocol (UDP).

B) Define the term Connection-oriented communication and Connection –less communication.

Solution:

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Connection-oriented communication includes the steps of setting up a call from one computer to another, transmitting/receiving data, and then releasing the call, just like a voice phone call. However, the network connecting the computers is a packet switched network, unlike the phone system's circuit switched network. Connectionless service is typically provided by the TCP.

Connectionless communication is just packet switching where no call establishment and release occur. A message is broken into packets, and each packet is transferred separately. Moreover, the packets can travel different route to the destination since there is no connection. Connectionless service is typically provided by the UDP (User Datagram Protocol).

C) What is difference between physical and logical topology?

Solution:

A physical topology describes how devices are physically cabled together. A logical topology describes how devices communicate across the physical topology.

D) Difference between Distance Vector Routing Protocol and Link State Routing Protocol.

Solution:
Distance Vector Routing:
☐ Entire routing table is sent as an update
☐ Distance vector protocol send periodic update at every 30 or 90 second
☐ Update are broadcasted
☐ Updates are sent to directly connected neighbor only
☐ Routers don't have end to end visibility of entire network.
☐ Distance vector routing protocol network may have patch in network carrying wrong information
☐ It is proned to routing loops
☐ Routing loop avoidance Mechanism used are as below :
1>Max Hop Count
2> Split horizon
3> Route poisoning
4> Hold down Timer
☐ Distance vector routing protocol has slow convergence due to periodic update.
Eg. RIP

Link State Routing:
☐ Updates are incremental & entire routing table is not sent as update
☐ Updates are triggered not periodic
☐ Updates are multicasted
☐ Update are sent to entire network & to just directly connected neighbor
☐ Updates are carry SPF tree information & SPF cost Calculation information of entire topology
☐ Routers have visibility of entire network of that area only.
☐ No routing loops

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☐ Convergence is fast because of triggered updates.
☐ Eg. : OSPF

E) Explain broadcast network, point to point network and Multipoint networks.

Solution:
Broadcast Network: A computer network which has a single communication channel. A packet sent by one computer is received by all the others computers on the network. In telecommunication and information theory, broadcasting refers to a method of transferring a message to all recipients simultaneously. Broadcasting can be performed as a high level operation in a program, for example broadcasting Message Passing Interface, or it may be a low level networking operation, for example broadcasting on Ethernet.
Point to Point Network: A simple Point to Point Network is a permanent link between two endpoints. A point-to-point connection provides a dedicated link between two devices. The entire capacity of the link is reserved for transmission between those two devices. Most point-to-point connections use an actual length of wire or cable to connect the two ends, but other options, such as microwave or satellite links, are also possible. When you change television channels by infrared remote control, you are establishing a point-to-point connection between the remote control and the television's control system.
Multipoint Network: A multipoint (also called multidrop) connection is one in which more than two specific devices share a single link. In a multipoint environment, the capacity of the channel is shared, either spatially or temporally. If several devices can use the link simultaneously, it is a spatially shared connection. If users must take turns, it is a timeshared connection.

Each unit is of 12.5 marks.

Unit- I

Ques 6: Compare and contrast FDMA, TDMA and CDMA techniques.

Solution:
In case of FDMA the bandwidth is divided into separate frequency bands. In case of TDMA the bandwidth is timeshared. On the other hand in case of CDMA data from all stations are transmitted simultaneously and are separated based on coding theory. Unlike FDMA, CDMA has soft capacity, which means that there is no hard limit on the number of users. Capacity of FDMA and TDMA is bandwidth limited, whereas the bandwidth of CDMA is interference limited. CDMA offers high capacity in comparison to FDMA and TDMA. CDMA also help to combat multipath fading

Ques 7: What is ISDN? Explain types of services provided by ISDN.

Solution:
Integrated Services Digital Network is a set of digital transmission protocols defined by the international standards body for telecommunications, the ITU-T (previously called the CCITT).

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These protocols are accepted as standards by virtually every telecommunications carrier all over the world. ISDN complements the traditional telephone system so that a single pair of telephone wires is capable of carrying voice and data simultaneously. It is a fully digital network where all devices and applications present themselves in a digital form. The essential difference between ISDN and the conventional telephone system is that it is digital not analogue. Information travels as bits rather than as waves. In addition, it also allows multiple streams of these bits to occupy the same connection, providing the user with greater versatility of services.
ISDN Services: There are two kinds of services provided by ISDN.

Network Services:
- Network Services define how the user and the network interact with each other in order to manage calls.
- The user can use Network Services to request the network to perform functions such as making and clearing calls, transferring calls to another user, and so on.
- This activity is known as signaling. For example: setting up calls and disconnecting them

Bearer Services:
- Bearer services carry the call activity that the user is performing at any given moment.
- This includes voice calls, fax and modem calls, and connections to the Internet.
- Broadly speaking, there are two forms of bearer service.
  - Structured Data - the information passing over the bearer service is in a format that is understood by the network. Voice is an example of structured data. Because the network knows that the connection carrying voi ce, it can convert the data into an analogue signal in the event that the call is connected to an ordinary analogue phone.
  - Unstructured Data - the format of the information is not understood by the network, but is understood by the two users at either end of the service.

Unit-II

Ques 8: Define ATM. What are advantages of ATM Network?

Solution:

"Asynchronous Transfer Mode", is a high-speed network technology that supports the transportation of voice, data, and video signals over a single stream. ATM combines both circuit and packet switching methods into one flexible technology that makes for simple network processing functions. That digital data is encoded in the form of small fixed size cells (53-byte units) instead of the variable sized packets used by Internet Protocol or Ethernet. This ensures that the packets can be sent quickly and easily. ATM is connection oriented, which means that data sent through the ATM network will always follow the same pre-defined path with the data arriving in the order it was sent.

Advantages of ATM Network
The high-level benefits delivered through ATM services deployed on ATM technology using international ATM standards can be summarized as follows:

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- Dynamic bandwidth for bursty traffic meeting application needs and delivering high utilization of networking resources; most applications are or can be viewed as inherently bursty, for example voice is bursty, as both parties are neither speaking at once nor all the time; video is bursty, as the amount of motion and required resolution varies over time.
- Smaller header with respect to the data to make the efficient u se of bandwidth.
- Can handle mixed network traffic very efficiently: Variety of packet sizes makes traffic unpredictable. All network equipments should incorporate elaborate software systems to manage the various sizes of packets. ATM handles these problems efficiently with the fixed size cell.
- Cell network: All data is loaded into identical cells that can be transmitted with complete predictability and uniformity.

Unit-III

Ques 9: What role the active token monitor performs?

Solution:

Token ring is maintained with the help of active token monitor. Any one of the stations has the capability to act as active token monitor, but at a particular instant only one acts as active token monitor. It monitors various error situations such as multiple token, orphan packet, etc, and takes appropriate action to come out of the error situation.

Ques 10: What is the advantage of token passing protocol over CSMA/CD protocol?

Solution:

The CSMA/CD is not a deterministic protocol. A packet may be delivered after many (up to 15) collisions leading to long variable delay. An unfortunate packet may not get delivered at all. This feature makes CSMA/CD protocol unsuitable for real-time applications. On the other hand, token passing protocol is a deterministic approach, which allows a packet to be delivered within a known time frame. It also allows priority to be assigned to packets. These are the two key advantages of token passing protocol over CSMA/CD protocol.

Unit-IV

Ques 11: What is vulnerable period? How it affects the performance in MAC protocols?

Solution:
The total period of time when collision may occur for a packet is called vulnerable period. Let, all packets have a fixed duration λ. Then vulnerable period is 2λ in pure ALOHA scheme and λ in slotted ALOHA scheme. If vulnerable period is long, probability of the occurrence collision increases leading to reduction in throughput.

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Ques 12. How throughput is improved in slotted ALOHA over pure ALOHA?

Solution:

In pure ALOHA vulnerable period is 2λ.

So, S/G = e-2G or throughput S = G e-2G , where G is the total number of packets.

Maximum value of G = 0.5 or maximum throughput Smax = 1/2e.

In slotted ALOHA, vulnerable period is λ   and S/G = e-G or throughput S = G e-G . Here,

maximum value of G is 1 and maximum throughput Smax = 1/e.

Ques 13. What is the parameter 'a'? How does it affect the performance of the CSMA protocol?

Solution:

The efficiency of CSMA scheme depends on propagation delay, which is represented by a parameter 'a' as defined below.

$$a = \frac{\text{propagation delay}}{\text{packet transmission time}}$$

 Smaller the value of propagation delay, lower is the vulnerable period and higher is the efficiency. If propagation delay is zero, collision cannot occur in CSMA scheme. But in practice, there is some delay and depending on the value of 'a' collision occurs.

Ques 14 . How performance is improved in CSMA/CD protocol compared to CSMA protocol?

Solution:

In CSMA scheme, a station monitors the channel before sending a packet. Whenever a collision is detected, it does not stop transmission leading to some wastage of time. On the other hand, in CSMA/CD scheme, whenever a station detects a collision, it sends a jamming signal by which other station comes to know that a collision occurs. As a result, wastage of time is reduced leading to improvement in performance.

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