(1) What advantage does a circuit-switched network have over a packet-switched network have over a packet-switched network? what advantages does TDM have over FDM in a circuit-switched networks?

Ans Packet switching network is not suitable for real real time services. In circit switched network it can give end to end bandwidth during a call. In the Packet switched network Quality of service is guaranteed while in Packet switched network it is not guaranted and Packet switched network might have delay and time insensitive.

TDM has an advantage over FDM as it gives bandwid saving and there is low interference between multiplexed signals. In TDM, same frequency operatey operate all connections, but In FDM, Dissenant frequencies operate all connections.

(2) Suppose users share a 2 Mbps link. Also suppose each user transmits continuously at 1 Mbps when transmitting, but each user transmits only 20 percent of the time.

(a) When circuit switching is used, how many user can be supported?

Ans 2 users can be supported each user requires half of the link bandwith.

b) For the remainder of this problem, suppose packet switching is used. why will there be.

Ans since each user requires 1 Mbps when transmitting, if two or fewer users transmit simultaneously, a maximum of 2 Mbps will be required.

i) essentially no queuing delay before the link if two or fewer users transmit at the same time.

Ans. Since, the avaible bandwidth of the shared link is 2 Mbps, there will be no queuing delay before the link.

ii) why will there be a queuing delay is three users transmit at the same time.

Ans if three users transmit simultaneously, the bandwith required will be 3 Mbps which is more than the available bandwith of the shared links. In this case, there will be queuing delay before the link.

(3) How long does it take a packet of length 1000 bytes to propagate over a link of distance 2500 km, propogation speed $2.5 * 10^8$ m/s, and transmission rate 2 Mbps? More generally, how long does it take a packet of length L to propagate over a link of distance d, propagation speed s, and transmission rate R bps? Dose this delay depends on pacet length? Does this delay depends

Length of packets (L) = 1000 bytes
Link distance (d) = 2500 km
Speed of propagation (s) = $2.5 * 10^8$ m/s
Transmit rate (R) = 2 mbps = 2,000,000 bytes/sec.

Transmission delay = L/R

$= \frac{8 * 1000}{2000000}$

= 4 milliseconds.

Propagation delay = d/s

$= \frac{2500}{2.5 \times 10^8}$

= 10 milliseconds.

Hence,
Finding total time by adding transmission and propagation delay

Total required = 4+10 = 14 milliseconds.

Propogation delay is not caused by packet length. It depends on speed and distance traveled

Propogation delay is not caused by transmission rate. It depends on speed and distance travelled.

4) 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 $R_1 = 500$ Kbps, $R_2 = 2$ Mbps, and $R_3 = 1$ Mbps.

(a) Assuming on other traffic in the network, what is the throughput for the file transfer.

Ans Throughput is limited by the minimum of the capacity of the links, here, minimum is R_1, so the throughput is 500 Kbps.

(b) 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?

Ans By dividing the size of the file by the throughput together approximate time to transfer to B.

$$t = \frac{4 \times 10^8 \div 8}{500 \times 10^3} = 64 \text{ sec}.$$

(c) Repeat (a) and (b), but now with R_2 reduced to 100 Kbps.

Ans R_2 being reduced to 100 Kbps, so the amount is now 1000 Kbps

time to transfer $t = \frac{4 \times 10^8 \times 8}{100 \times 10^3} = 320$ sec.

the links R_1, R_2 and R_3 are connected sequentially, so the whole transfer has to wait for the slowest link that is why do not consider individual transfer time.

5) What is the different between network architecture and application architecture?

Network architecture	Application architecture.
Network architecture refers to the organization of the communication process into layers	Application architecture on the other hand, is designed by an application developer and dictates the broad structure of the application.
How any network of any local area or wide area is called the network architecture.	How any application is built is called the application architecture
Example - The five layer Internet architecture s	Example - client server or P2P.

6) What is the difference between why do HTTP, SMTP and POP3 run on the top of TCP rather than on UDP?

As TCP is connection oriented protocol and it is suited for applications which use high reliability and where transmission time is relatively less critical for application than that use UDP where as UDP needs applications ~~to~~ need fast, Efficient transmission such as games.

Its features of handling small queries from huge number of clients is used for servers, Hence this is the reason why TCP is the most commonly used

application protocol such HTTP, SMTP, POP3.

Also because TCP is more reliable, and HTTP, FTP, SMTP and POP3 cannot be assordable using UDP while UDP cannot transmit packet and guarantee a well-order delivery.

TCP is a connection-oriented network so packet will be delivered to the destination.

E) For the given questions, indicating where in the HTTP response message

a) what is the URL of the document requested by the browser?

A) The URL of the document is cs453/index.html

b) what version of HTTP is the browser running?

A) The browser is running version 1.1 of HTTP.

c) Does the browser request a non-persistent or a persistent connection?

A) The browser requests a persistent connection. This is shown by the line "connection: keep-alive".

d) what is the IP address of the host on which the browser is running?

A) The IP address of the host on which the browser is running is gaia.cs.umass.edu.

e) what is the type of browser initates this message? why is the browser type needed in an HTTP request message.

A. The type of browser that initates this message is Mozilla 5.0 on windows. The browser type is needed in a HTTP request message because different browsers may handle the same webpage differently, due to having different capabilities.

(B) True or False:

i) Processes on the diffent systems communicate with each other by exchanging messages across the computer.

A) True.

(ii) A clint server architecture achieves perfect security.

A) FALSE.

(iii) Socket is a hardware interface through which a process sends messages into, and receives messages from the network.

A) False.

(iv) No data loss is tolerated in multimedia application such as conventional audio/video.

A) True

4) developing a new network application for the internet often requires one to decide whether to choose UDP or TCP.

5) True

7) Explain the services offered by DNS and also explain the DNS record and message format.

DNS is a distributed hierarchical system that maps domain names to their corresponding IP addresses.

The services offered by DNS include:

1. Name resolution:- DNS maps domain names to their corresponding IP addressing, allowing users to access resources on the internet using easy-to-remember names rather than numerical IP addresses.
2. Load balancing:- DNS can be used to distribute traffic across multiple servers enabling high availability and improved performance.
3. Email routing:- DNS is used to route email messages to the correct mail servers based on the recipient's domain name.
4. Authentication: DNS can be used to store security-related information such as public keys for encryption and digital signatures.

DNS records are the data structures used to store information about domain names in DNS servers. The most commonly used DNS record types include:

1. A record :- maps a domain name to an IPv4 addresse
2. AAAA record :- maps a domain name to an IPv4 address.
3. MX record :- specifies the mail server responsible for handling email for a domain.
4. NS record :- specifies the authoritative name servers for a domain.
5. CNAME records :- maps an alias to the canonical name for a domain.

10) What are the different types of transport services provided by the internet?

A) (1) Transmission control protocol (TCP)
(2) User Datagram protocol (FTP)
(3) File Transfer protocol (~~SMTP~~) (FTP)
(4) Simple mail Transfer protocol (SMTP)
(5) Hyperter transfer protocol (HTTP)
(6) Secure sockets layer (SSL)