



[Any examinee found adopting unfair means will be expelled from the trimester/program as per UIU disciplinary rules.]

There are **Three (03)** questions. Answer **all questions**. All questions are of values indicated on the right-hand margin.

Q1.

a) Consider the following graph and explain **Queuing delay** in terms of **Traffic Intensity**.

[2]



b) What are the two different **Switching technologies** used in a network? Explain the main differences among them along with their advantages & disadvantages. According to you, which one is more efficient?

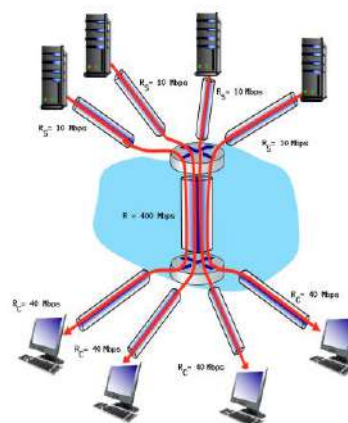
[3]

c) Consider the scenario shown below with four different servers connected to four different clients sharing a common middle link. Now answer the following questions:

[3]

- i. What is the maximum achievable end-end throughput (in Mbps) for each of four client-to-server pairs, assuming that the middle link is shared?
- ii. Which link is the bottleneck link?

Assuming that the servers are sending at the maximum rate possible, what are the link utilizations for the client links (R_c)?



d) Suppose that a host wants to send 180 Bytes of data onto a twisted-pair copper wire. Find the **Transmission delay** and the **Propagation delay**, if the distance and the transmission rate are 400 km and 10Mbps, respectively. Also, calculate the total nodal delay.

[4]

Q2.



a) What information is used by a process running on one host to identify a process running on another host?

[1]

b) Suppose Mr. A, with a Web-based e-mail account (a10@hotmail.com), sends an email to Mr. B (b30@yahoo.com), who accesses her email using IMAP.

With a diagram explain how the email moves from A's host to B's host. Also, identify the application-layer protocols used to move the email between the two hosts. Note that you have to draw the diagram only. [2]

c) **Scenario 1:** The ISP requests a DNS query to the nearest available server, which in turn forwards it to its upper-level server.

Scenario 2: The ISP manually sends the queries to all the available servers.

Differentiate between the Scenarios. Which one will be better and why? [3]

d) Suppose a website contains 1 HTML file, 10 CSS files, and 5 Javascript files.

HTML	100 KB
CSS	30 KB
Javascript	50 KB

The RTT required for connection setup is **0.3s**. The bandwidth between the server and the client is **0.5 Gbps**. The distance between the client and the server is **5km**. Propagation speed is **200m/microsec**.

Now, calculate the **response time** required to retrieve the base files and images under the following conditions: [3+3]

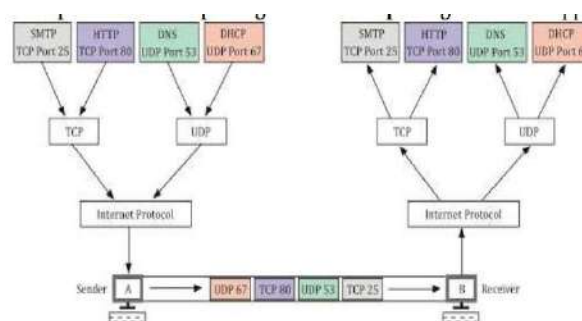
- Non-persistent HTTP without parallel connection
- Persistent HTTP without pipe-lining

Q3.

a) How does **layering architecture** simplify network operations? [1]

b) How do you differentiate between **TCP** and **UDP**? When would you use UDP for data communication and when would you use TCP instead? [2]

c) Identify and explain how **multiplexing** and **de-multiplexing** have been applied in the following scenario. [3]



End of Paper – Thank You

