



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

There are 2 (Two) questions. Answer **both** of them. All questions are of values indicated on the right-hand margin.

Q1. a) What are the two network switching technologies? Briefly describe pros and cons of each of the technologies along with one real-life example. [2]

b) Consider a network with a capacity of $C = 15$ Mbps. Suppose that each user requires a fixed rate $R = 1.5$ Mbps when transmitting, but each user independently transmits only 10% of the time. Compare circuit-switched network and packet-switched network in terms of advantages and disadvantages using the given data and scenario. [3]

c) What are encapsulation and decapsulation in layering architecture? Suppose, a message is sent by Host A to Host B. Illustrate how encapsulation and decapsulation happens during the data/message transmission in the following topology:

[1 + 3 = 4]

Host A → Switch 1 → Router 1 → Hub 1 → Host B

d) A packet switch receives a packet P and determines the outbound link to which P should be forwarded. When the packet arrives, one other packet is halfway done being transmitted on this outbound link and 500 other packets are waiting to be transmitted. Packets are transmitted in order of arrival. Suppose all packets are 1500 bytes long and the link capacity is 5 Mbps. What is the transmission delay for each packet? What is the queuing delay for the packet P? [3]

e) Suppose a process wants to send an L -byte message to its peer process, using an existing TCP connection. The TCP segment consists of the message plus 20 bytes of header. The segment is encapsulated into an IP packet that has an additional 20 bytes of header. The IP packet in turn goes inside a Data Link frame that has 30 bytes of header and trailer. What percentage of the transmitted bits in the physical layer corresponds to the overhead if $L = 1000$ bytes? [3]

Q2. a) List 3 (Three) distinct differences between Client-server and Peer-to-peer architecture. [3]

b) A web page consists of 6 (Six) images and a base HTML file of size 5 Kilobytes hosted in a HTTP server. The RTT between the client and server is 800 msec, the size of each image is 1000 Kbytes and the average throughput between the client and server is 1 Mbps. Calculate the total time required to download the web page and its entire contents if the web client is using (i) Persistent HTTP, and (ii) Non-persistent HTTP. [4]

c) Suppose Alice, with a Web-based e-mail account (such as Hotmail or gmail), sends a message to Bob, who accesses his mail from his mail server using POP3. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application-layer protocols that are used to move the message between the two hosts. From a user's perspective, what is the difference between the download-and-delete mode and the download-and-keep mode in POP3? [4]

d) Suppose a client process (Browser) in a host named "UIU-Pc19" wants to communicate with the HTTP server process running on "ucam.uiu.ac.bd".

i. Show the necessary diagram and the steps at intermediate servers to show how the hostname "ucam.uiu.ac.bd" will be resolved using iterative query process. Assume that caches at all the intermediate servers are empty. [3]

ii. List the entries (name to IP mappings) cached in the local DNS server after the process. [1]