



[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]