United International **University** (**UIU**)

Dept. of Computer Science and Engineering (CSE)

MidTerm Exam Year: **2024** Semester: **Fall**

Course: **CSE 323/3711** Title: **Computer Networks (Section – B/C/E/F)**

Marks: **30** Time: **1 Hour 30 minutes**

[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** questions. All questions are of values indicated on the right-hand margin.

Q1.

a) Why Packet Switching is used in today's Internet technologies over Circuit switching. **[2]**

b) Consider a network with a capacity of **C = 75 Mbps**. Suppose that each user requires a fixed rate **R=500 kbps** when transmitting, but each user independently transmits **only 30% of the time** or with probability **p=0.3**.

i. Using **circuit switching**, how many users can be supported? **[2]**

ii. For the rest of this problem, assume **packet switching** is used with a total of **N=20 users**. What is the probability that **less than or equal to 15 (K<=15)** users are active? **[2]**

c) Specify **2 distinct advantages** of using **layering architecture to** simplify network operations. List **1 protocol** and **1 service** in each of the layers of TCP/IP.

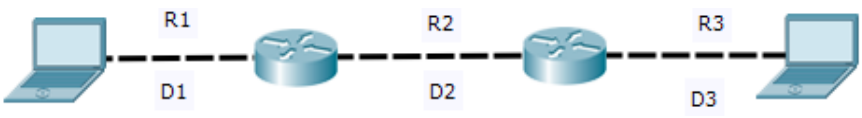
[2 + 1 = 3]

d) Suppose a process wants to send a **message** of **4000 bytes** to its peer process, using an existing TCP connection. Each **TCP segment** can carry **maximum 500 bytes** of application data. 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 combined**.

i. What **percentage of the transmitted bits** in the physical layer corresponds to the **overhead**? **[1]**

ii. If we increase maximum data size in a single segment from **500 bytes** to **1000 bytes**, is it an **advantage** or **disadvantage**? **Justify** in terms of **delay**. **[2]**

e) In the following topology, suppose, **Host A** wants to send **3 (three)** packets to **Host B**. Size of each packet is **2000 Bytes**. Both the routers apply **store and forward** packet switching, i.e., receives entire packet before forwarding. For this example, assume **R1 = 800 bps, R2 = 5 Mbps** and **R3 = 500 Kbps, D1 = 200 m, D2 = 2 Km** and **D3 = 500 m**. Propagation speed of medium = **2.1×10^8 ms^{-1}**. If packet processing time in each router is **100 ms**, what will be the **total time** required to send **all 3 packets** to **Host B**. **[3]**



Q2.

a) Suppose that **Alice** wants to build a new **network application** which can be accessed over a TCP/IP network. When designing the application what kind of decision(s) he has to make first? How his **application architecture** differs (or, will differ) from the network architecture? Why Saddam should choose P2P over the other one? **[3]**

b) Why HTTP is called as **stateless protocol**? Compare between **HTTP 1.0** and **HTTP 1.1** and **HTTP/2**. How does the HTTP protocol communicate with a transport-layer protocol? Give an example. **[4]**

c) Suppose that **Bob**, with a **web-based e-mail** account (bobgmail.com), sends an email to **Natasha** (natasha@mail.ru), who accesses her email but does not want to keep the record of her emails in the mail server once she has retrieved them.

With the aid of a diagram, demonstrate how the email moves from Fahim's host to Natasha's host. In addition, identify the application-layer and the transport-layer protocols used to move the email between the two hosts. **[4]**

d) Suppose that **Alice** has opened a new startup business, namely **iot-techgagets.com**. Describe the steps how the name is registered at DNS register. Once registered, **Bob's** browser wants to know the **IP address** of **iot-techgagets.com**. The authoritative **DNS server** for iot-techgagets.com is **dns.iot-techgagets.com**. How the DNS name will be resolved? Explain with the aid of diagrams why a particular query approach will be chosen over the other. **[4]**

←End of Paper – Thank You→