**COMSATS University Islamabad, Lahore** **Campus**

**Assignment-II – Spring 2024**

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| Course Title: | Computer Networks | | | | Course Code: | CSC340 | | Credit Hours: | 4(3,1) |
| Course Instructor/s: | Dr Tariq Umer | | | | Programme Name: | BS Software Engineering | | | |
| Semester: | 5th | Batch: | FA22-BSE | Section: | A | Date: | 04-05-24 | | |
| **Dead line** |  | | | | **Maximum Marks:** | | **40** | | |

**Question: CLO-1 Summarize the fundamental concepts of computer networks.**

Total Marks: 40 Due Date: May 10, 2024

Question 1- (10)

(a) How long does it take a packet of length 1000 bytes to propagate over a link of distance 2500km, propagation speed 2.5x10 m/s, and transmission rate 2 Mbps?

(b) 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?

(c) Dose this delay depend on packet length?

(d) Does this delay depend on transmission rate?

Question 2- (10)

Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links of rate R1=500kbps, R2=2Mbps, and R3=1Mbps.

a.  Assuming no other traffic in the network, what is the throughput for the file transfer?

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?

c.  Repeat (a) and (b), but now with R2 reduce to 100kpbs.

**3. A TCP flow has a 2-Gb/s link with a latency of 2 seconds that transfers a 20 MB file. The receiver advertises a window of 2 MB, and the sender has an unlimited congestion window. [10]**

a. How many RTTs does it take until slow-start opens the send window to 2MB? Assume a TCP packet size

of 1500 bytes.

b. How many RTTs does it take to send the file?

c. What is the effective throughput of the transfer? If the time to send the file is given by the number of required

RTTs multiplied by the link latency.

d. What percentage of the link bandwidth is utilized

Q4- Host **A** and **B** are communicating over a TCP connection, and Host **B** has already received from **A** all bytes up through byte 136. Suppose Host **A** then sends two segments to Host **B** back-to-back. The first and second segments contain 80 and 60 bytes of data, respectively. In the first segment, the sequence number is 137, the source port number is 312, and the destination port number is 80. Host **B** sends an acknowledgement whenever it receives a segment from Host A. **[10]**

1. In the second segment sent from Host **A** to **B**, what are the sequence number, source port number, and destination port number?
2. If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?
3. If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?