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ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION
 DURATION: 1 HOUR 30 MINUTES

WINTER SEMESTER, 2022-2023
 FULL MARKS: 75

CSE 4773: Internetworking Protocols

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer all 3 (three) questions. Figures in the right margin indicate full marks of questions whereas corresponding CO and PO are written within parentheses.

1. a) Identify the five layers in the Internet Protocol Stack. Explain the principal responsibilities of these layers. 10
(CO1)
(PO1)
- b) Consider the network configuration depicted in Figure 1. Three nodes, A, B, and C, simultaneously send 1000-byte messages to Destination Node Dhaka. Routers R1 and R2 forward the data. All connections operate at 100 Mbit/s and signal propagation occurs at a speed of $\frac{2c}{3}$ for all links. Here, c denotes the speed of light. Figure 1 also shows link lengths and the switching method sets a maximum packet length of 500 bytes. The routers re-transmit received packets in their arrival order, with priority given to $A > B > C$ in case of simultaneous reception. Node latency is 25 microseconds. Calculate the end-to-end delay for this message transmission. 15
(CO1)
(PO2)

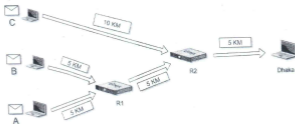


Figure 1: Network configuration for Question 1.b)

2. a) Explain the operating modes of HDLC (High-Level Data Link Control) in computer networking. 5
(CO1)
(PO1)
- b) Consider a scenario where a host possesses the IP address 130.23.43.20 and the physical address B2:34:55:10:22:10. This host intends to send a packet to another host with the IP address 130.23.43.25 and the physical address A4:6E: F4:59:83:AB. However, the physical address is unknown to the sender. 10
(CO1)
(PO1)
- Illustrate the essential steps involved in an Address Resolution Protocol (ARP) operation to discover the unknown address.

- c) Mr. X intends to transmit 5000 KBytes of data to Mr. Y through a noisy channel. In this scenario, for every successful 100-bit transmission, the channel experiences a loss of the subsequent 10 bits of data. Assuming a maximum packet length of 64 bits, which includes 50 bits of data and 14 bits of control information, calculate the following: 10
(CO2)
(PO2)
- i. Determine the number of packets required for Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective Repeat ARQ protocols. The window size is 6.
 - ii. Evaluate the performance of each protocol in successfully completing the data transmission.
3. a) "In Mobile IP, when a mobile host moves, information about its new location must be sent to the corresponding (fixed) host." Justify the statement. 5
(CO2)
(PO1)
- b) Discuss briefly the inefficiencies in Mobile IP communication and the solution to the Triangle Routing problem. 5
(CO2)
(PO1)
- c) Four senders, S_1 , S_2 , S_3 , and S_4 share a communication channel using CSMA/CD. Here the conditions are: 15
(CO2)
(PO2)
- No propagation delay
 - An inter-frame gap of 1-time unit
 - Collision detection after 1-time unit
 - A 1-time unit jam sequence.

Illustrate the communication scenario and measure the total time units required for the stations to complete data transmission in the CSMA/CD medium access in the following case:

- At $t = 0$ to $t = 4$, S_1 transmits data.
- At $t = 1$, $t = 2$, and $t = 3$, S_2 , S_3 , and S_4 each have frames to transmit with respective lengths of 2, 4, and 3 time units.
- At $t = 20$, S_1 has a new frame of length 2 to submit.
- At $t = 31$, S_4 has a new frame of length 2 to transmit.
- The successive backoff times for S_1 is (1-2-3-4), S_2 is (2-4-3-4), S_3 is (4-3-1-1), and S_4 is (3-2-1-2).