YILDIZ TECHNICAL UNIVERSITY
FACULTY of ELECTRICAL & ELECTRONICS ENG. / DEPT. of COMPUTER ENGINEERING

Student Name Surname:	**Number:**			**Signature:**	
Course: BLM3033 Gr1 & Gr2	**Date/Time: 19/04/2022 13:00**			**Duration: 75 min.**	
Exam. Type: Midterm	**MidT 1 ☒**	**MidT 2**	**MakeUp**	**Final**	**MUFinal**
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Q1) Suppose end system A wants to send a large file to end system B. At a very high level, describe how end system A creates packets from the file. When one of these packets arrives to a router, what information in the packet does the router use to determine the link onto which the packet is forwarded? Why is packet switching in the Internet analogous to driving from one city to another and asking directions along the way? **(15p)**

A1) End system A breaks the large file into chunks. It adds header to each chunk, thereby generating multiple packets from the file. The header in each packet includes the IP address of the destination (end system B). The packet switch uses the destination IP address in the packet to determine the outgoing link. Asking which road to take is analogous to a packet asking which outgoing link it should be forwarded on, given the packet's destination address.

Q2) Suppose you would like to urgently deliver 50 terabytes data from İstanbul to Ankara. You have available a 100 Mbps dedicated link for data transfer. Would you prefer to transmit the data via this link or instead use "Yurtiçi Kargo" overnight delivery? Explain.? **(15p)**

A2) $50 \times 10^{12} / 100 \times 10^{6} = 5 \times 10^{5}$ s
500000 / (60x60x24) = 5,78 day

Overnight delivery is bettern then transmitting data via the 100 Mbps link.

Q3) What is the HOL blocking issue in HTTP/1.1? How does HTTP/2 attempt to solve it? **(15p)**

A3) The HOL blocking problem is a large file in the webpage (i.e. video clip) will take a long time to pass through the bottleneck link such that it blocks other small objects behind it. HTTP/2 solves this problem by breaking each message into small frames, and interleave the request and response messages on the same TCO (Transmission Control Protocol) connection.

Q4) SMS, iMessage, Wechat, and WhatsApp are all smartphone real-time messaging systems. explain how they differ? **(15p)**

A4) iMessage and WhatsApp are different than SMS because they use data plan to send messages and they work on TCP/IP networks, but SMS use the text messaging plan we purchase from our wireless carrier. Moreover, iMessage and WhatsApp support sending photos, videos, files, etc., while the original SMS can only send text message. Finally, iMessage and WhatsApp can work via WiFi, but SMS cannot.

Q5) Describe why an application developer might choose to run an application over UDP rather than TCP. **(15p)**

A5) An application developer may not want its application to use TCP's congestion control, which can throttle the application's sending rate at times of congestion. Often, designers of IP telephony and IP videoconference applications choose to run their applications over UDP because they want to avoid TCP's congestion control. Also, some applications do not need the reliable data transfer provided by TCP.

Q6) Consider a reliable data transfer protocol that uses only negative acknowledgments. Suppose the sender sends data only infrequently. Would a NAK-only protocol be preferable to a protocol that uses ACKs? Why? Now suppose the sender has a lot of data to send and the end-to-end connection experiences few losses. In this second case, would a NAK-only protocol be preferable to a protocol that uses ACKs? Why? **(15p)**

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A6) On a channel with no packet loss, corrupted messages would be explicitly retransmitted upon receiving a NAK. Thus, the protocol works if there are only bit errors. However, if packet loss occurs, the sender can no longer tell whether a message has been correctly received by the receiver or lost in the absence of a NAK.

Q7) What is the role of the forwarding table within a router? **(15p)**

A7) The role of the forwarding table within a router is to hold entries to determine the outgoing link interface to which an arriving packet will be forwarded via switching fabric.

Q8) Suppose datagrams are limited to 1,500 bytes (including header) between source Host A and destination Host B. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 consisting of 5 million bytes? Explain how you computed your answer. **(15p)**

A8) MP3 file size = 5 million bytes. Assume the data is carried in TCP segments, with each TCP segment also having 20 bytes of header. Then each datagram can carry 1500-40=1460 bytes of the MP3 file

Number of datagrams required $= \left\lceil \frac{5\times10^6}{1460} \right\rceil = 3425$. All but the last datagram will be 1,500 bytes; the last datagram will be 960+40 = 1000 bytes. Note that here there is no fragmentation – the source host does not create datagrams larger than 1500 bytes, and these datagrams are smaller than the MTUs (Maximum transmission unit) of the links.

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