

INSTRUCTIONS

1. This is an **OPEN BOOK** assessment.
2. Calculators are allowed, but not laptops or other electronic devices.

Please DO NOT upload questions and answers onto the Internet.

1. Which of the following makes up the end-to-end delay?
 - A. processor delay, processing delay, queueing delay, transmission delay
 - B. packing delay, propagation delay, receiving delay, transmission delay
 - C. processing delay, propagation delay, queueing delaying, transmission delay
 - D. routing delay, propagation delay, queueing delay, receiving delay
 - E. None of the above
2. Which of the following statement regarding the Internet is TRUE?
 - A. A call setup is always performed before data transmission starts.
 - B. The Internet is structured as a network of networks.
 - C. A packet passes through no more than two autonomous systems to reach destination host.
 - D. The only access network technologies allowed are Ethernet and cable modem.
 - E. None of the above
3. Which of the following statement regarding TCP is TRUE?
 - A. TCP uses triple duplicate ACKs as a loss indicator to trigger retransmission.
 - B. The first segment transmitted by a TCP sender after connection establishment always has sequence number 2.
 - C. TCP receiver interprets any packet reordering as an indication of packet loss.
 - D. A TCP socket is identified by 2-tuple: destination IP address and destination port.
 - E. None of the above.

4. What is the checksum (1's complement of the sum) of the following 2 bytes?
- 11011100
01100101
- A. 01000001
B. 00111110
C. 01000010
D. 10111101
E. None of the above
5. Which of the following statement regarding application layer protocol is FALSE?
- A. A browser can open only one TCP connection at a time.
B. HTTP typically runs over TCP.
C. Applications that have very strict time constraint but can tolerate packet loss should use UDP as the underlying transport protocol.
D. One reason DNS queries use UDP instead of TCP is because the use of TCP incurs a longer delay.
E. Application layer protocols regulate the communication behaviour of networked applications.
6. An IP datagram with destination address 192.168.1.10 reaches a router with the following 5 routing entries. Which entry will be used to forward this packet?
- A. 192.168.8.0/22
B. 192.168.1.0/24
C. 192.168.1.16/27
D. 192.168.0.0/23
E. 192.168.1.0/29
7. A file is transferred over an existing TCP connection (i.e., 3-way handshake is already done). The connection is still open after transmission. The first and last TCP segments have the sequence numbers 12345 and 2345 respectively. The last TCP segment carries 1000 bytes of data. What could be the size of the file transferred?
- A. 10,000 bytes
B. 4,294,957,296 bytes
C. 4,294,966,296 bytes
D. 4,294,958,296 bytes
E. None of the above

8. Which of the following statement regarding TCP is TRUE?
- A. If a TCP segment has sequence number m , then ACK for this segment will have sequence number $m + 1$.
 - B. If a TCP segment has sequence number m , then ACK for this segment will have acknowledgement number $m + 1$.
 - C. Host A is sending a file to Host B over a TCP connection. Assume Host B has no data to send Host A. Host B will not send acknowledgments to Host A because Host B cannot piggyback the acknowledgments on data.
 - D. Host A is sending a file to Host B over a TCP connection. If the sequence number of a TCP segment is m , then the sequence number of the subsequent segment must be greater than m .
 - E. None of the above
9. The distance from a sender to a receiver is 10,000 km and the propagation speed is 2×10^8 m/s. **Go-back-N** protocol is used and window size is set to 10. Each packet is 2,000 bits long and the size of packet header is negligible.
- Assume that no packet is lost or corrupted during transmission. Ignore transmission, queueing and processing delays. How long does it take to send 1 million bits from the sender to the receiver?
- A. 5 s
 - B. 50 s
 - C. 2.5 s
 - D. 0.005 s
 - E. None of the above
10. Consider a sender and a receiver communicating using **Selective Repeat** protocol. Sender's window size is 5. Sender just receives an ACK packet with sequence number 23. This ACK number falls within the sender's window. Which of the following could possibly be the sequence number for the next packet transmitted by the sender?
- A. 17
 - B. 18
 - C. 28
 - D. 30
 - E. None of the above

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Suggested answers

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|------|-------|
| 1. C | 6. C |
| 2. B | 7. D |
| 3. A | 8. E |
| 4. D | 9. A |
| 5. A | 10. C |