Electrical and Computer Engineering
Fall 2023 COMPREHENSIVE/BREADTH EXAM

Question 2/3/4	Communications, Controls, and Signal Processing	ECGR-4187: Data Comm. and Networking II

(1) **(10 points)** Select the **single** choice of correct answer or fill out blanks:

(a) An **IPv4** address consists of _____ bits.

(A) 4 (B) 8 (C) 32 (D) None of the above

(b) The binary equivalent of the IP address 223.1.3.28 is

_____

(c) The address class (Class A, B, or C) of the IP address, 165.24.8.127, is _____,

(d) For IP address 165.24.8.127, the network ID is _____,
host ID is _____.

(e) In IPv4 header, what is the value of the *Total Length* field if the header is 28 bytes and the data is 400 bytes?

(A) 428 (B) 407 (C) 107 (D) None of the above

(f) An IPv4 datagram is fragmented into three smaller datagrams. Which of the following is true?

(A) The *do not fragment* bit is set to 1 for all three datagrams.
(B) The *more* fragment bit is set to 0 for all three datagrams.
(C) The *identification* field is the same for all three datagrams.
(D) The offset field is the same for all three datagrams.

(g) In IPv4, if the fragment offset has a value of 100, it means that _____.

(A) the datagram is 100 bytes in size
(B) the first byte of the datagram is byte 100
(C) the first byte of the datagram is byte 800
(D) None of the above

(h) An **IPv6** address consists of _____ bits.

(A) 32 (B) 64 (C) 128 (D) None of the above

(i) UDP protocol is a _____ and _____ transport protocol.

(A) connection-oriented; reliable

(B) connection-oriented; unreliable

(C) connectionless; reliable

(D) connectionless; unreliable

(j) Connection establishment in TCP is called _____ handshaking.

(A) two-way

(B) four-way

(C) one-way

(D) None of the above

(2) **(5 points)** Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110.

(a) How much data is in the first segment? **(1 point) (Indicate unit in your answer)**

(b) Suppose that the first segment is lost but the second segment arrives at B. In the acknowledgment that Host B sends to Host A, what will be the acknowledgement number? **(1 point)**

(c) Assume the round-trip time between Host A and B is 10-msec. Consider the effect of using **slow start** on the TCP connection and NO congestion. The receiver window is 24 KB and the maximum segment is 2 KB. How long does it take ***before*** the first full window can be sent? **(3 points)**

(3) **(5 points)** Consider the TCP congestion control protocol. Assume that the maximum segment size is **1 KB**. Suppose that the TCP congestion window was initially 10KB, and a timeout occurred at time 0. Then if all next 12 transmissions are successful except that the 5th one has a timeout event. Please draw the size of TCP congestion window for the next 12 transmissions in the following figure.