CSE 123: Computer Networks
Winter Quarter, 2017
MIDTERM EXAM

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Name **SOLUTIONS**

Student ID _____

Question	Score	Points
1	15	15
2	30	30
3	14	15
4	30	30
5	10	10
Total	10	100

This exam is **closed book**. You are allowed one 8.5x11-inch (or smaller), double-sided sheet of paper containing whatever you would like (a "crib sheet"). **YOU MUST PUT YOUR NAME ON IT AND TURN THE CRIB SHEET IN WITH THE EXAM.**

The exam contains questions of differing point values. Each question is clearly labeled with its value. Please answer all questions in the space provided. You have 50 minutes to complete this exam. As with any exam, I suggest you read through all the questions first before answering any of them.

You will receive full credit for the final question regardless of your answers, but we would appreciate you taking the time to provide feedback. In order to preserve the anonymity of your responses, please **tear off the last page of the exam.** You may submit it separately at the end of the exam, or bring it to class with you next Wednesday.

GOOD LUCK!

1. (15 pts) True/False. Determine whether each of the following statements is true or false. No explanation is necessary; partial credit will not be awarded.

   a) The end-to-end argument states that functionality should be implemented at the highest layer possible.

   False. It states functionality should be implemented at a lower layer only iff it can be implemented completely and correctly.

   b) Protocols define how corresponding implementations at any given layer interact with each other.

   True.

   c) The bandwidth-delay product of a link is how long it takes to send a frame to the other side and get a response back.

   False; that's the round trip time (RTT).

   d) IPv6 link-local addresses are assigned by the Internet Assigned Numbers Authority (IANA).

   False. Link-local addresses are automatically assigned to each IPv6 interface on boot up.

   e) Switches only forward packets that are addressed to them.

   False. Switches listen to all frames on every network they are attached to, regardless of the destination of the frames (and, if necessary, forward appropriately according to their forwarding tables).

2. (30 pts) Short Answer. Concisely answer the following questions.

a) (5 pts) Write the IPv6 address FE80:0000:0000:0010:0000:AB0C:FEED:00AB as succinctly as possible.

FE80::10:0:AB0C:FEED:AB.

b) (5 pts) Suppose a code has two codewords: 01010 and 10101. How many bit errors can be detected? Corrected?

The code has a Hamming distance of 2k+1=5. So, 4 bits can be detected; 2 corrected.

c) (5 pts) Suppose that an Internet host sends a TCP segment on an Ethernet network. Draw a diagram of the frame as it appears on the wire, showing the location of the various protocol headers (i.e. rectangles indicating the order in which they appear in the frame).

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| Eth | IP | TCP | Payload |
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d) (5 pts) Suppose a router receives a 1500-byte IPv4 packet with a 20-byte IP header, IP ID x, MF = 1, and DF=0. It needs to forward it out a link with a 1000-byte MTU. What should the IP ID, length, offset, and flags (i.e., MF and DF) fields of the header of the 2nd fragment contain?

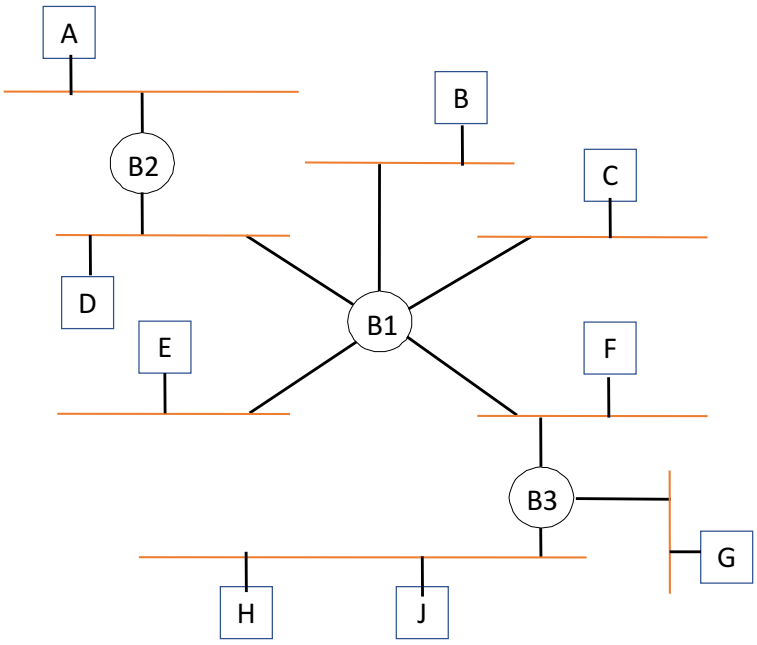
x**, 520, 980, MF=1, and DF=0.**

e) (10 pts) Suppose a sender using the CRC generator polynomial $x^5 + x^3 + x + 1$ needs to send the bits 11011010100. What bits are actually transmitted? Show your work.

```
101011 | 11011010100000000
         101011
          111011
          101011
           100000
           101011
             101110
             101011
                101000
                101011
                    11000
```

So it sends 11011010100011000.

3. (15 pts) Learning bridges. Consider the extended LAN shown below. Assume all bridges were just turned on and no frames have been sent. Three frames are subsequently sent in the order described below.



a) (5pts). Suppose host J sends a frame to host C. List the hosts that receive the frame.

A, B, C, D, E, F, G, and H.

b) (5pts). Afterwards, host E sends a frame to J. What hosts receive that frame?

F, H, and J.

c) (5pts). Finally, host D sends a frame to E. Which hosts receive this frame?

A and E.

4. (30 pts) IP Addressing. Consider the IP address 132.239.15.87.

a) (6 pts). Suppose that we were still using class-based addressing. What type of network would this IP address be a part of?

Class B.

b) (6 pts). If the network administrator had decided to break the network in part a) into 16 different subnets, what would the subnet mask of the subnet to which this IP address belongs be?

11111111.11111111.11110000.000000000 or 255.255.240.0

c) (6 pts). What is the subnet number (address) of the subnet to which this IP address would be attached?

132.239.0.0

d) (6 pts). Now suppose instead that we are using CIDR addressing instead of Class-based addressing and subnets. What would the length of CIDR prefix for the physical network in part c) to which the host were attached be?

/20.

e) (6 pts). Suppose a router had a routing table with three entries: default (0/0), 132.239.8/21, and the network in part d). Which entry would it use to forward a packet to 132.239.15.87? Why?

132.239.8/21, because it is the LMP.

PLEASE TEAR OFF THIS PAGE OF THE EXAM. YOU CAN SUBMIT IT AT THE END OF THE PERIOD, OR BRING IT TO CLASS NEXT MONDAY.

5. (10 pts) Feedback. Please provide feedback to allow the Professor to improve your class experience.

   - What is one thing that is going well for you in this class?

   - What is one thing that is not working well for you in this class? What can we do to help?

   - Is there something you would like the staff to do differently?

   - Please estimate the amount of time you spent on each homework and the project.

   - Do you find the assigned readings helpful?