

CSE 123: Computer Networks
Fall Quarter, 2018
MIDTERM EXAM

Instructor: Alex C. Snoeren

Name _____ **SOLUTIONS** _____

Student ID _____

Question	Score	Points
1	30	30
2	10	10
3	20	20
4	30	30
5	10	10
Total	100	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 on Friday.

GOOD LUCK!

1. (30 pts) Short Answer. Concisely answer the following questions.

- a) (8 pts) Suppose a sender and receiver are using the CRC generator polynomial $x^4 + x^3 + 1$ and the receiver receives the bit string 1010 1010 0100. Was the message received correctly? If so, what was it? If not, how do you know? Show your work.

```
101010100100
11001
 11000
 11001
    11001
    11001
```

Yes: 1010 1010

- b) (4 pts) Suppose the following bits arrive at an HDLC receiver. What is the payload of the frame?

```
0110 0111 1110 0101 1111 0110 1111 0101 0011 1111 0111 1101
```

0101 1111 1101 1110 1010

- c) (8 pts) Suppose someone designed a code over six-bit strings that had an efficiency of 33% and a Hamming distance of 3. How many codewords would there be in the code? How many bit errors could the code correct?

4 codewords; 1 bit

- d) (10 pts) Suppose a router receives a 1500-byte packet with IP ID 28, MF=0, DF = 0, TTL = 12, and Offset = 1480 (stored as 185 in the header). It decides to forward the packet out a port where the MTU is only 300 bytes. What are the corresponding header fields for the 3rd fragment sent?

IPID 28, MF 1, DF 0, TTL 11, Offset 2040 (255)

2. (10 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) LSPs include a router's distance to each network.

False; only neighbors

b) There are four times as many IPv6 addresses as IPv4 addresses.

False; they are four times as long

c) Flow control ensures a receiver never receives packets out of order.

False; flow control just ensures the receiver can buffer them

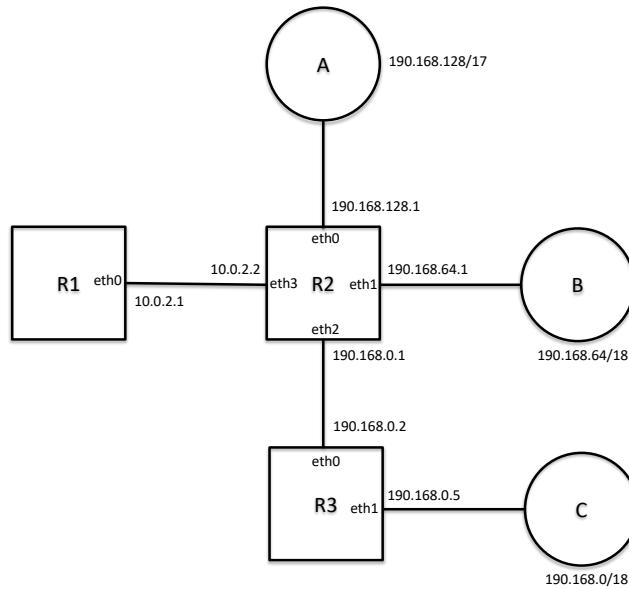
d) IP routers are store-and-forward devices.

True

e) Two-dimensional parity has a Hamming Distance of two.

False; it can detect all two-bit errors, so has distance of at least 3

3. (20 pts) Consider the IP network shown below, where $R1$, $R2$, and $R3$ are routers, A , B , and C are networks with the given CIDR prefix, and each router interface has the IP address shown.



- a) A portion of $R2$'s forwarding table is shown below. Fill in the missing entries.

Destination	Next Hop
127.0.0.0/8	loopback
default	10.0.2.1
10.0.2/24	eth3
190.168.0.0/30	eth2
190.168.0.0/18	190.168.0.2
190.168.64.0/18	eth1
190.168.128.0/17	eth0

- b) What is the most concise way $R1$ can describe the network reachable through the next hop 10.0.2.2?

190.168.0/16

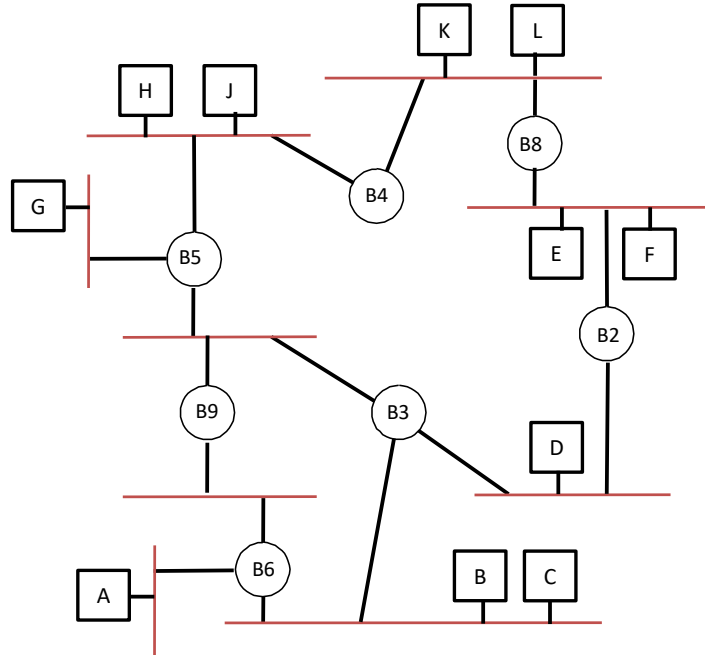
- c) What class of network is the network in part b)?

Class B

- d) What is the netmask a host on network C would use? Presuming network C is a subnet of the network in part b), how many bits are used for the subnet number?

255.255.192.0, 2 bits

4. (30 pts) Consider the extended LAN shown below; circles correspond to learning bridges while squares are hosts. Assume all bridges were just turned on and no frames have been sent.



- a) (10 pts). Indicate on the figure which ports—if any—will be turned off in the final spanning tree.

Both ports of B9, northbound port of B5

- b) (5 pts). What is the final configuration message being sent by B6?

(B2, 2, B6)

- c) (15 pts). Suppose the following frames (and only these frames) are sent in the order indicated. For each frame, say which hosts will receive it.

Frame	Recipients
D sends a message to C	All hosts
G sends a message to C	All hosts
L sends a message to D	D, E, F, K and L

