

CSE 123: Computer Networks
Fall Quarter, 2023
QUIZ 1

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Name _____ **SOLUTIONS**
Student ID _____

Question	Score	Points
1	10	10
2	30	30
3	25	25
4	25	25
5	10	10
Total	100	100

This quiz 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 QUIZ.**

The quiz 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 quiz. As with any quiz, 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 quiz**. You may submit it separately at the end of the exam, or bring it to class with you on Monday.

GOOD LUCK!

1. (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) If a router fragments an IP packet containing a TCP segment, each fragment will contain a copy of the TCP header.

False; fragmentation does not consider the payload. (They each contain their own copy of the IP header.)

- b) The protocol field of an IP header indicates which link-layer protocol should be used to forward the frame.

False; it specifies the transport protocol used by the payload.

- c) A host using a send window of size $(\text{bandwidth} \times \text{the one-way delay})$ is fully utilizing the link.

False; it requires the $\text{bandwidth} \times \text{RTT}$.

- d) It is possible for an IP address to match two CIDR prefixes of the same length.

False, prefixes of the same length must differ in at most one bit.

- e) Bridges have at least one IP address.

False; only network-level devices have IP addresses.

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

- a) (8 pts) List two different methods a host can use to identify frames within a bitstream.

Possible answers include sentinels, fixed-length framing, and time-based framing.

- b) (12 pts) Suppose a code consists of four codewords, 1000, 0100, 0010, and 0001. What is its Hamming Distance? Rate? Is it efficient? Can it detect all single-bit errors?

Hamming distance of 2. Rate of $\log_2(4) = 2\text{-bit input}/4\text{-bit codewords} = 0.5$. No, it is not efficient because there are four-bit strings of Hamming distance 2 from a code word (e.g., 1110) are not themselves a codeword. Yes, because a code can detect $2d$ bit flips, and here $2d + 1 = 2$ which implies $2d = 1$.

- c) (10 pts) Suppose a router receives a 700-byte packet with a standard 20-byte header. Within that header, the IP ID field is set to 23, MF=1, DF = 0, TTL = 12, and Offset = 680 (stored as 85 in the header). It decides to forward the packet out a port where the MTU is only 204 bytes. How many fragments are created? What are the contents of the following header fields for each fragment?

4 fragments

IPID:	MF:	DF:	TTL:	Len:	Offset:
23	1	0	11	204	85 (680 bytes)
23	1	0	11	204	108 (864 bytes)
23	1	0	11	204	131 (1048 bytes)
23	1	0	11	148	154 (1232 bytes)

3. (25 pts) More Short Answer. Concisely answer the following questions.

- a) (9 pts) Given your understanding of the HDLC protocol (which employs frame delimiters and bit stuffing), assume that the following bit stream arrives at the receiver:

```
0010 1101 1111 1000 1010 1011 1111 1111 0110 0101 1010
0110 1111 1011 1011 1111 0110 1000 0000 1111 0010 0101
0111 1110 1010 1110 1011 1111 1001 1010 1001 1101 1111
1001 1010 1101 1110 0110 1110 1110 1101 1110 0101 0000
```

Highlight (e.g., circle, underline, or otherwise indicate above) and calculate the total number of:

- Frame delimiters - **4**
- Stuffed zeros - **1**
- Received errors - **2**

- b) (16 pts) Consider the IP address 73.112.161.212. Suppose we were still using class-based addressing. To what class of network would this address belong?

Class A (4 pts)

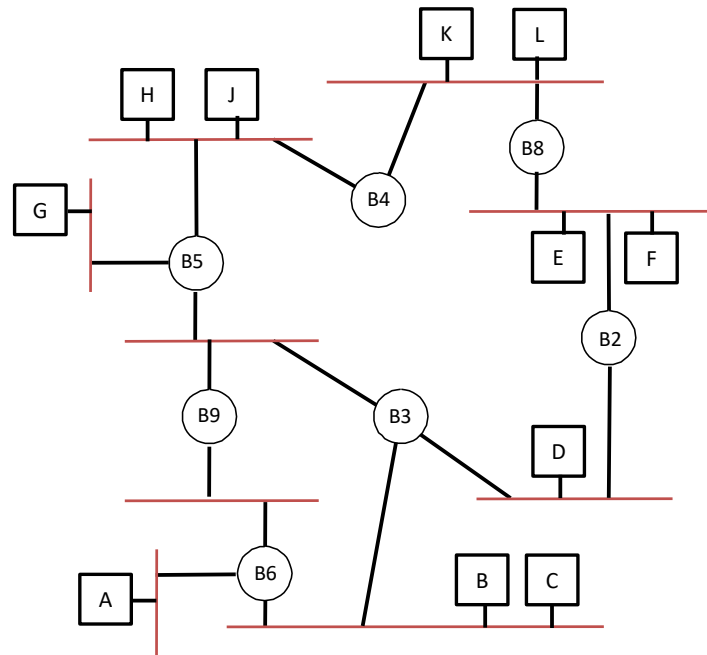
Suppose the network administrator had subnetted that network into 4K subnets. How many bits would be required for the subnet number? What would the subnet mask be for this host?

12 bits (4 pts); 255.255.240.0 (or 1111111111111111100000000000 in binary) (4 pts)

Now suppose that that same (sub)network was described using CIDR notation. How would you do so? I.e., what is the CIDR prefix that describes the (sub)network to which the host is attached?

73.112.160/20 (2 pts for prefix, 2 pts for length)

4. (25 pts) Consider the extended LAN shown below; the bridges (depicted as circles) all have the indicated IDs; hosts are depicted as squares. Bridge IDs follow the natural order, i.e., $B1 < B2 < B3$.



- a) (5 pts). Indicate which ports are disabled once the spanning tree algorithm converges by marking the corresponding links with an “x”.

Both ports of B9, northbound port of B5

- b) (5 pts). After convergence, what is the configuration message being sent by B3? Which bridges will receive the message?

(B2, 1, B3) (2 pts) to B5, B9, B6 (3 pts)

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

Frame	Recipients
F sends a message to A	All hosts and bridges (1 pt)
K sends a message to F	L, E, F, B4, B8, B2 (6 pt)
A sends a message to K	B, C, D, E, F, G, K, L, B6, B3, B5, B9, B2, B8, B4 (8 pts)

PLEASE TEAR OFF THIS PAGE OF THE QUIZ. YOU CAN SUBMIT IT AT THE END OF THE PERIOD, OR BRING IT TO CLASS ON 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 project (so far).