

# CMPSCI 120

## Fall 2019

### Midterm Exam #1

### Solution Key

### Monday, October 7, 2019

### Professor William T. Verts

<1> 30 Points – Answer any 30 of the following questions. Answer more for extra credit. Blank answers will be ignored. **Correct answers gain 1 point. Incorrect answers lose one-half point (but the total will not go below zero).** For example, if you answer all 35 questions, and get 25 correct but the other 10 are incorrect, the final score for this question will be  $25 - (10/2) = 20$ .

<b>Yourself!</b>	Who is the easiest person in the world to fool?
<b>Pareidolia</b>	What is it called when I hear evil messages in songs played backwards?
<b>Confirmation Bias</b>	“I always win the game when I wear my lucky shirt” is an example of what kind of bias?
<b>8</b>	How many bits are in a byte?
<b>256</b>	How many distinct values can be stored in a byte?
<b>0</b>	What is the decimal value of the smallest number storable in a byte?
<b>255</b>	What is the decimal value of the largest number storable in a byte?
<b>32</b>	How many bits make up an IPv4 address?
<b>128</b>	How many bits make up an IPv6 address?
<b>Star</b>	What network type has a big central computer with many terminals?
<b>Point-to-Point</b>	What network type has a direct wire between each pair of computers?
<b>Token Ring</b>	What network type is in the form of a circle?
<b>Collision</b>	What is it called when computers talk simultaneously on Ethernet?
<b>DNS</b>	What service maps URLs into IP addresses?
<b>NO</b>	My wireless print server is at IP address 192.168.1.104 – can anyone on the Internet see my printer except me?
<b>Hub</b>	What device connects a lot of machines where everyone sees all traffic?
<b>Username</b>	In a URL, what is the <b>~verts</b> part called?
<b>Time To Live</b>	What is it called when a DNS mapping of a URL to its IP expires? <b>TTL</b>
<b>Cache Poisoning</b>	What is it called when bad guys make DNS map URLs to wrong IPs?
<b>Packet Sniffer</b>	What is the program called that watches packet traffic on a server?

<b>T</b>	T/F: A router can hide a local network behind a single IP address.
<b>T</b>	T/F: An 802.11g device talks to an 802.11b router at the lower speed.
<b>F</b>	T/F: All packets are guaranteed to reach their destination.
<b>T</b>	T/F: Packets may arrive at their destination out of order.
<b>F</b>	T/F: The Internet completely fails if someone nukes a major city.
<b>F</b>	T/F: Only a small amount of the email traffic worldwide is SPAM.
<b>T</b>	T/F: It is legal to use an IP address in a Web URL directly.
<b>F</b>	T/F: Top-level country codes always use the Roman alphabet.
<b>F</b>	T/F: An email is more like a letter in an envelope than a postcard.
<b>F</b>	T/F: It is OK to send grandma your credit card number in a plain email.
<b>F</b>	T/F: When you request a number of resources from a server, you have exclusive use of the server until all of your requests have been served.
<b>Pharyngulation</b>	Voting many times in an on-line poll to shift the results is called what?
<b>Web Spider or Web Crawler</b>	What kind of program follows links to catalog many Web pages?
<b>NO</b>	Should you trust emails that say, “Click here to check your account”?
<b>Monty Python</b>	Where does the term “spam” come from to indicate unwanted email?

<2> 15 Points – Here is an IPv4 address, in 32-bit binary:

**10000000.01110111.00000001.01001100**

A. (4 points – 1 point per byte) What is the IPv4 address using the dot notation?

**128.119.1.76**

B. (2 points) In classful addressing what is the class represented?

**Class B**

C. (3 points) In classful addressing what is the network identifier (in binary)?

**00000001110111** (-1 if they include the leading 10 that identifies the class)

D. (3 points) In classful addressing what is the machine identifier (in decimal)?

**332**

E. (2 point) In CIDR /18 what is the network identifier (in binary)?

**100000000111011100** (first 18 bits)

F. (1 point) In CIDR /18 how many bits are in the machine identifier?

**14** (32 – 18)

<3> 10 Points – In the following URL identify the protocol, the host address, the username (if any), the folder path (if any), and the requested resource (if any).

**https://frog.snorgletax.com/fred/taxes/2018/taxpic.gif**

Protocol: **https://** (2 points)

Host Address: **frog.snorgletax.com** (3 points)

Username: **missing (no tilde character)**

Folder Path: **fred/taxes/2018** (3 points, -1 if **fred** identified as username)

Resource: **taxpic.gif** (2 points)

<4> 10 Points – I have a Web color defined as #2FF6D5.

A. (3 points) What is the decimal value of the red component?

**47**

B. (3 points) What is the decimal value of the green component?

**246**

C. (3 points) What is the decimal value of the blue component?

**211**

D. (1 point) *Approximately* what color is shown on screen? (It doesn't have to be exact, just get it in the ballpark.)

**Cyan, Turquoise, Aqua**

<5> 10 Points – Short Answer – How does a Web spider/crawler work? Will it index all the pages on the Web? Why or why not?

(4 points) A crawler starts with a number of **known pages**, **follows all their links** to new pages (**ignoring links to pages it has already indexed**), and continues as far as it can.

(1 point) **No**, it cannot index all pages on the Web.

(5 points – must have more than one of these answers) Pages get **moved to new IP addresses**, may be **deleted**, may **not have any in-bound links**, may be **behind a pay-wall or password**, and many pages don't exist statically but are **generated dynamically** in response to a request.

<6> 10 Points – Short Answer – An on-line poll on a site supporting candidate X over candidate Y for an election, requiring a password in order to vote at all, asks the question “Do you support candidate X?” and the given answers are “Yes, candidate X is the best one for the job”, “No, candidate Y squishes kittens in his spare time” and “No, candidate Y will let the terrorists win”. Discuss all the reasons this is a poorly designed poll.

1. **Because the site requires a password, the only people likely to register will tend to be those who already agree with the site’s mission of supporting candidate X.**
2. **Rather than simply having YES or NO answers, there are “reasons” attached to the answers that a voter may or may not agree with.**
3. **With one YES and two NO answers, the poll is combining two questions into one (Do you support candidate X? and If not, why not?)**
4. **The two NO answers splits the vote for candidate Y, making it look like heavier support for candidate X than candidate Y.**
5. **The NO votes contain *ad hominem* attacks on candidate Y, attacking the person rather than the candidate’s arguments.**

**Must have at least two of these answers (5 points each).**

<7> 15 Points – Longer Answer – Consider an Ethernet wire with several computers on it. Machine A wants to send a message to machine Z, and Machine B wants to send a message to Machine X. Describe the process they go through in order to “talk”, and then describe what happens and how they react when the messages collide. Please use the back of the page for your answer.

(3 points) Both Machine A and Machine B **listen to the wire until it is quiet.**

(3 points) When the wire is quiet, **both start talking at the same time.**

(4 points) Since both machines are listening to what they themselves are saying, the collision will cause **what they hear to be different from what they say.**

(5 points) As soon as they detect the collision, they **both stop talking,** then **wait a random amount of time** before they start the listening process again. The random wait is so that it is unlikely they will get into the same situation a second time: one will start listening before the other, and if the wire is quiet they’ll get the chance to talk first.