CMPSCI 120
Fall 2018
Midterm Exam #1
Solution Key
Friday, October 10, 2018
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.

Yourself!	Who is the easiest person in the world to fool?
Pareidolia	What is it called when I hear evil messages in songs played backwards?
Confirmation Bias	"I always win the game when I wear my lucky shirt" is an example of what kind of bias? (A case can be made for correlation vs. causality.)
8	How many bits are in a byte?
256	How many distinct values can be stored in a byte?
0	What is the decimal value of the smallest number storable in a byte?
255	What is the decimal value of the largest number storable in a byte?
32	How many bits make up an IPv4 address?
128	How many bits make up an IPv6 address?
Star	What network type has a big central computer with many terminals?
Point-to-Point	What network type has a direct wire between each pair of computers?
Token Ring	What network type is in the form of a circle?
Collision	What is it called when computers talk simultaneously on Ethernet?
DNS	What service maps URLs into IP addresses?
No	My wireless print server is at IP address 192.168.1.104 – can anyone on the Internet see my printer except me?
Hub	What device connects a lot of machines where everyone sees all traffic?
Host Name	In a URL, what is the **www.cs.umass.edu** part called?
TimeToLive|TTL	What is it called when a DNS mapping of a URL to its IP expires?
Cache Poisoning	What is it called when bad guys make DNS map URLs to wrong IPs?
Packet Sniffer	What is the program called that watches packet traffic on a server?
T	T/F: A router can hide a local network behind a single IP address.
F	T/F: An 802.11g device talks to an 802.11b router at the higher speed.
F	T/F: All packets are guaranteed to reach their destination.
T	T/F: Packets may arrive at their destination out of order.
F	T/F: The Internet completely fails if someone nukes a major city.
T	T/F: Most of the email traffic worldwide is SPAM.
F	T/F: It is not legal to use an IP address in a Web URL directly.
T	T/F: A switch is used to isolate sections of a network from each other.
Postcard	Is an email more like a letter in an envelope or a postcard?
No	Is it a good idea to send sensitive information in a plain email?
No	You get email from a rich prince offering you money if you can move millions through your bank account for him. Is this legitimate?
Pharyngulation	Voting many times in an on-line poll to shift the results is called what?
Spider|Crawler	What kind of program follows links to catalog many Web pages?
No	Should you trust emails that say, "Click here to check your account"?
Monty Python	Where does the term "spam" come from to indicate unwanted email?

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

11000000101010000000000101101000

A. (4 points) What is the IPv4 address using the dot notation?

11000000 = 192, 10101000 = 168, 00000001 = 1, 01101000 = 104

192.168.1.104

B. (1 point) Yes/No: In classful addressing is this a private use network?

Yes

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

Class C

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

00000101010000000001 (underlined above)

E. (3 points) In classful addressing what is the machine identifier (in binary)?

01101000

F. (2 points) In CIDR **/22** how many bits are in the machine identifier?

(32 – 22) = **10**

<3> 10 Points – What are the advantages of CIDR over classful addressing?

In classful addressing there are very few individual networks (slightly over two million), and the size of any particular network is very coarse: networks can contain only 256, 65536, or 16777216 unique machines. For many systems 256 machines is way too few, but jumping straight to 65536 is wasteful of IP addresses. Jumping to 16777216 machines is even more wasteful.

With CIDR, **there can be many more individual networks, and the size of a network has much finer granularity**. That is, there can be networks with 256 machines, networks with 512 machines, networks with 1024 machines, etc. **This reduces waste of IP addresses** (which delayed but did not completely forestall the IPv4 exhaustion in 2011).

<4> 10 Points – An on-line poll asks a question with one "Yes" answer and two "No" answers. The results are 40% for "Yes" and 30% for each of the two "No" answers, so the "Yes" answer wins. Is this a well-designed poll? Why or why not?

4 points: No, this is not a well-designed poll.

6 points: While the "Yes" answer won because it had more votes than either of the two "No" votes, the **total number of "No" votes was 60%**. By having two "No" answers, the poll **split the vote** and gave an unfair advantage to the "Yes" answer. If this was done intentionally, it would have been done by people who wanted "Yes" to win.

<5> 10 Points – I see a political ad on TV saying that a candidate's opponent's economic position is flawed because he squishes kittens in his spare time.

A. (3 points) What kind of bias is being exhibited here?

This is **ad hominem** bias – going after the person making the argument instead of the argument itself.

B. (2 points) Is the candidate appealing to your System 1 or System 2 response?

System 1.

Remember that System 1 is running all the time, and generates answers quickly, regardless of whether or not they are correct. System 1 is tied to emotion, while System 2 is much more logical but does not run all the time and takes considerable energy to activate and to run. The candidate is appealing to emotion (*oh, my god, he squishes kittens; that's awful*) rather than to logic (*how good or bad is the economic position*).

C. (5 points) Which of Haidt's five axes are being exploited by the candidate? Explain.

Haidt's five axes are harm, fairness, in-group loyalty, respect for authority, and sanctity/purity.

An argument can be made that people's reactions will be influenced by the **harm axis** (harm to kittens), or the **sanctity/purity axis** (squished kittens are messy and may be filthy or carry disease). I would accept other arguments if they are well supported.

<6> 10 Points – Both ice cream consumption and sunblock purchases peak in July and August. Is this a correlation or a causality argument? Explain your answer.

4 points: This is a **correlation** argument.

6 points:

Eating ice cream does not cause sunburn, nor does sunburn cause ice cream consumption (not directly, anyway). **Both are results of increased sun and sun exposure in the summer months.**

Increased sun → hotter temperatures → people want to be cool → get some ice cream

Increased sun → sun exposure → sunburn

So, ice cream consumption and sunburns in summer are correlated to each other because they **both are caused by increased sun**, but **neither is a direct cause of the other**.

<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. You may use the back of the page for your answer.

Both Machine A and Machine B **listen to the wire until it is quiet**. When the wire is quiet, **both start talking at the same time**. 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**. 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.