CSC 102 ♦ HOW THE INTERNET WORKS
TAKE-HOME EXAMINATION
DUE 5:00 PM ON FRIDAY, 11 MARCH

You may not consult any person other than the professor when completing the exam, but you may use references online and in print. Wherever you use external sources, please include a URL or citation with your answer. Don't forget to use quotation marks when copying verbatim from a source. There will be a certain amount of Web searching necessary to respond to several of the questions. Wikipedia will be accepted as a source of answers for purposes of this exam. You may also have to use Google or its equivalent intelligently, and some of the other tools we have studied.

Data Transmission (16 points)

Recent work has developed an information storage technology that writes data on small glass disks that will be stable over very long periods of time. (For more details, see http://www.southampton.ac.uk/news/2016/02/5d-data-storage-update.page.) The developers say that one glass disk can store 3600 terabytes of data.

a.) How many 800 MB DVDs could be stored on one of the new glass disks?
b.) Using an Ethernet with a capacity of 100 megabits per second, how many hours would it take to transmit the contents of one full glass disk?
c.) Suppose that you mail one full glass disk to your friend on the other side of the country. It arrives exactly two days (48 hours) later. What is the effective data transfer rate, in gigabits per second? (Round to the nearest integer.)
d.) What is the latency of the transfer in the scenario above?

Protocols (8 points)

Aliens have tampered with your computer! They garbled some of the software responsible for your internet communications. You know that only one of the layers of the protocol stack has been affected. Which layer would you suspect in each of the following scenarios?

a.) You can view the source of HTML pages, but they don't display properly.
b.) Your computer can broadcast messages, but cannot connect to any other hosts in the local area network.
c.) You can ping a computer across the country, but when you try to transfer a whole file it gets scrambled up.
d.) You can only connect to the hosts that are on your local area network, and no others.

Hosts (16 points)

Identify the location of the following internet hosts, as specifically as you can. Show your work.

a.) 127.0.0.1
b.) 128.119.240.93
c.) 166.111.4.100
d.) 131.229.64.3

HTML (16 points)

Give the raw HTML that would accomplish the following tasks:

a.) Apply the rules from a CSS file called **`mystyle.css`**.
b.) Include an image of a cat that is stored in the file **`catphoto.jpg`**.
c.) Create a link to the file **`page2.html`** stored in the same folder, with link text **Next**.
d.) Automatically play the sound file **`mood.mp3`** in the background over and over, without visibly changing the page.

Multimedia (8 points)

Explain why you might decide to include multiple copies of the same video when creating a web site. What are the pros and cons of doing so? How many copies would you recommend, and why?

Email (10 points)

Create the raw text of an email with the following properties:

a.) It will appear to come from **`Sophia.Smith@afterlife.org`**, and is addressed to Kathy McCartney.

b.) If the recipient writes back, the reply will be sent to your own Smith email.

c.) The message is sent one minute before midnight on October 31, 1870, Eastern US time.

d.) The subject of the message is “Advice to Future Presidents.”

e.) The body of the message will say, “Don’t believe in ghosts.”

Security Online (12 points)

Suppose that you are considering providing sensitive personal information (such as a credit card number) to a web site that appears to belong to a company that you would like to do business with. Under what circumstances can you feel confident in doing this without inadvertently revealing your credit card number unintentionally to any third parties? List all the entities involved in completing the secure transaction. How is the identity of each one verified? For each interaction/relationship, say whether trust is implicit or verified through credentials by each side. If the latter, identify the type of credential required.

Web Search (14 points)

Consider the configuration of pages below. Assuming that all pages begin with a weight of 1.0, what would be the weight assigned to each page after one iteration of the simple PageRank computation demonstrated in class?