Exam 1
27 October 2005

Directions.

• Do not turn this page over until told to do so.
• This exam is closed-book. You may not use anything other than a pen or pencil to complete it.
• You have exactly 60 minutes to complete the exam. To help you budget your time, I have suggested time limits for each part of the exam.
• Read all directions and questions carefully.
• Work quickly but carefully. If possible, double-check your answers before turning in your exam.
• If you cannot answer a question, move on and return to it later.
• If you have a question during the exam, raise your hand or quietly come down to the front of the lecture hall to speak with a member of the teaching staff.
• If you must use the restroom during the exam, quietly come down to the front of the lecture hall and leave your exam with a member of the teaching staff before exiting the lecture hall.
• If you finish the exam within 50 minutes, you may come down quietly to the front of the lecture hall to turn in your exam. If you finish the exam within the last 10 minutes of the exam period, however, please remain in your seat until the period’s end, so as not to disturb other students during the final moments of the exam.
• Close your eyes, take a deep breath, and think to yourself: “That silhouette makes this exam look fun!”

Please complete the following. (Print clearly.)

Name: ____________________________________________________________

“I understand that some students may not be taking this exam at the same time as I am. I affirm that I will neither reveal the contents or difficulty of this exam to any such student nor discuss it with any such student.”

Signature, in agreement with the above: __________________________________
Multiple Choice. (1 point each. Suggested time: 6 minutes.)

For each of the following questions or statements, circle the letter (a, b, c, or d) of the one response that best answers the question or completes the statement.

1. A CPU’s speed is measured in
   a. Gb.
   b. Gps.
   c. GB.
   d. GHz.

2. A DIMM is a
   a. microprocessor.
   b. type of RAM module.
   c. type of memory inside of a CPU.
   d. type of non-volatile memory.

3. What is the bandwidth of a typical Ethernet cable?
   a. 1.5 Mbps
   b. 1.5 MBps
   c. 100 Mbps
   d. 100 MBps

4. A floppy disk can store about
   a. 4.7 GB.
   b. 1.44 MB.
   c. 650 MB.
   d. 670 KB.

5. If the letter ‘A’ is represented in ASCII as the binary number 01000001, then the letter ‘B’ is represented as the binary number
   a. 01000010.
   b. 66.
   c. 10000010.
   d. 01000011.

6. Which of the following domain names could Rei not buy, even if no one else owned it?
   a. OneReingToRuleThemAll.com
   b. USofRei.gov
   c. AdvancedResearchProjectsAgency.net
   d. Reiboot.org
7. Via which protocol are emails sent?
   a. POP
   b. SMTP
   c. FTP
   d. HTTP

8. Which of the following is not a type of expansion card?
   a. ISA
   b. PCI
   c. PCMCIA
   d. PS/2

9. Which of the following has been proposed for networking entire cities wirelessly?
   a. Bluetooth
   b. WAN
   c. WiFi
   d. WiMAX

10. Which of the following is not a valid ccTLD?
    a. .us
    b. .them
    c. .jp
    d. .uk

11. Which of the following is the largest computer network in the world?
    a. The Microsoft Network (MSN)
    b. America Online (AOL)
    c. The Internet
    d. The Intranet
True or False. (1 point each. Suggested time: 5 minutes.)

For each of the following statements, circle either T if the statement is true or F if the statement is false.

12. T F 802.11g supports a transfer rate of 54 Mbps.
13. T F Cable modems usually offer upload speeds much higher than download speeds.
14. T F The largest decimal value that can be represented in binary with 8 bits is 255.
15. T F A patch cable is used to connect a computer to a switch.
16. T F There are 1,024 bytes in a kilobyte.
17. T F There are 8 bytes in a bit.
18. T F In decimal, 10 denotes ten; in binary, 10 denotes two.
19. T F WANs are networks of LANs.
20. T F The Internet and the World Wide Web are the same thing.
21. T F Registers only store 32 megabytes.
22. T F CMOS settings are stored in ROM.
Remember this? (6 points. Suggested time: 6 minutes.)

23. When people talk about the amount of “memory” in their computer, they’re usually, as you now know, talking about their computer’s RAM. However, computers actually comprise many types of memory. In fact, hard disks, level-1 cache, level-2 cache, and RAM qualify as memory types. Each of these four memory types can be found in different quantities and at different locations in the so-called “pipeline” through which data travels from a computer’s hard disk to a CPU.

In the space below, sketch this so-called “pipeline” that exists between a hard disk and a CPU, making sure to note the locations of each of these four memory types. Also jot down how much of each memory type is likely to be present in this “pipeline.”

Finally, explain in a sentence or more, why these memory types are present in such different quantities.
The road to Harvard. (3 points each. Suggested time: 5 minutes.)

Consider the below, an excerpt from the output of `traceroute` on a PC that details the path along which data might travel from an apartment in Somerville, Massachusetts, where the resident’s personal computer has a cable-modem connection to the Internet through RCN (a local ISP), to Harvard’s FAS webservice.

```
traceroute to www.fas.harvard.edu from an apartment in Somerville, Massachusetts
1 192.168.22.1 (192.168.22.1) 77.460 ms 31.353 ms 28.117 ms
2 10.65.92.2 (10.65.92.2) 24.109 ms 22.260 ms 21.597 ms
3 10.65.92.1 (10.65.92.1) 23.091 ms 22.201 ms 20.137 ms
4 corel.mbo.ma.rcn.net (209.6.2.234) 22.092 ms 23.794 ms 23.544 ms
5 Serial1-1-1.GW3.BOS1.ALTER.NET (137.39.135.213) 26.230 ms 69.590 ms 27.005 ms
6 126.ATM2-0.XR2.BOS1.ALTER.NET (146.188.177.222) 24.562 ms 27.109 ms 29.076 ms
7 290.ATM6-0.XR2.NYC1.ALTER.NET (146.188.176.186) 41.740 ms 28.623 ms 28.095 ms
8 194.ATM10-0-0.GW2.NYC2.ALTER.NET (146.188.178.149) 34.044 ms 32.331 ms 29.393 ms
9 att-new-york-gw.customer.ALTER.NET (157.130.0.14) 41.347 ms 30.758 ms 31.699 ms
10 gbr2-p00.n54ny.ip.att.net (12.123.1.50) 50.857 ms 54.453 ms 54.322 ms
11 gbr1-p50.cblma.ip.att.net (12.122.2.14) 54.760 ms 55.154 ms
12 ar3-a300al.cblma.ip.att.net (12.127.5.37) 56.956 ms 63.601 ms 58.570 ms
13 12.126.99.6 (12.126.99.6) 57.018 ms 58.180 ms 67.079 ms
14 192.5.66.10 (192.5.66.10) 58.686 ms 58.594 ms 58.052 ms
15 sc-gw.fas.harvard.edu (140.247.20.2) 57.417 ms 87.999 ms 104.266 ms
16 * scmr-gw.fas.harvard.edu (140.247.6.1) 175.951 ms 103.100 ms
17 * www.fas.harvard.edu (140.247.30.60) 195.229 ms 182.208 ms
```

24. What do each of the numbered lines in the above data represent?

25. Does data from the apartment seem to travel straight from Somerville to Cambridge in order to reach the Harvard campus? Why or why not?

26. What is the IP address of Harvard’s FAS webservice?
Who's in cmd? (3 points each. Suggested time: 3 minutes)

Consider the below, an excerpt from the output of `ipconfig` on a PC.

```
Ethernet adapter 100Base-T:
  Physical Address. . . . . . . . . : 00:0B:CD:82:57:E7
  Dhcp Enabled. . . . . . . . . . . : Yes
  IP Address. . . . . . . . . . . . : 192.168.1.101
  Default Gateway . . . . . . . . . : 192.168.1.1
```

27. What is the Ethernet address of this PC?

28. What does it mean for this PC to be "Dhcp Enabled"?

29. What is the IP address of the first router between this PC and the rest of the world?

Rapid Fire. (4 points each. Suggested time: 24 minutes)

The following questions are intended to solicit (nearly) instantaneous responses from you. We expect (and will accept) no more than three sentences for each of your answers.

30. Why, technically speaking, is it a bad idea to place a floppy disk near a magnet?

31. Why, technically speaking, is it a bad idea to drop a HDD?
32. What’s the purpose of L1 and L2 cache?

33. WHY SHOULD YOU NOT USUALLY WRITE EMAILS IN ALL CAPS?

34. Why do users with cable modems sometimes experience slower Internet connections after, oh, 5:00 P.M. on weekdays?

35. What is phishing?

36. Why is a switch said to be “smarter” than a hub?

37. Why does the Internet tend to function even if a router on a major backbone goes down?
“I’ve lost my mobo’s labels!” (12 points. Suggested time: 6 minutes)

38. In 2004, Austin Powers lost his mojo—er, mobo. This year, the mobo has lost its labels. Next year, this joke will no longer be funny.

Consider the mobo below, six of whose connectors are highlighted with arrows. At the end of each arrow, name one piece of hardware that could be connected to the connector at which the arrow is pointing; do not simply cite the type of connector. For instance, had we highlighted the parallel port, a correct answer would be “a printer,” whereas an incorrect answer would be “a parallel port.” Rest assured that more than one answer might be possible for a connector.
**Ack! Ronyms! (1 point each. Suggested time: 5 minutes.)**

Match each of the ten acronyms below with a corresponding description by writing the letter next to that description on the line next to the acronym. Do not draw lines connecting acronyms with descriptions. For each acronym, there is only one description that is appropriate. You should use each description exactly once.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGP</td>
<td>A. antiquated expansion bus</td>
</tr>
<tr>
<td>DSL</td>
<td>B. bus for peripherals</td>
</tr>
<tr>
<td>FTP</td>
<td>C. file-transfer protocol</td>
</tr>
<tr>
<td>ISA</td>
<td>D. incoming mail protocol</td>
</tr>
<tr>
<td>LCD</td>
<td>E. Internet address</td>
</tr>
<tr>
<td>PCMCIA</td>
<td>F. flat-panel display</td>
</tr>
<tr>
<td>POP</td>
<td>G. laptop expansion bus</td>
</tr>
<tr>
<td>SMTP</td>
<td>H. outgoing mail protocol</td>
</tr>
<tr>
<td>URL</td>
<td>I. type of Internet connection</td>
</tr>
<tr>
<td>USB</td>
<td>J. video-card bus</td>
</tr>
</tbody>
</table>
Extra Credit. (5 points.)

Only attempt to answer the following three questions if you have completed the rest of the exam and have double-checked your answers! Collectively, these questions are only worth 5 points. The rest of the exam, mind you, is worth 100 points!

49. Perform the following calculation in binary. Be show to show your work, including any 1s carried. (Here’s hoping enough light bulbs go off in your head!)

\[
\begin{array}{c}
11111111111111111111111111111111 \\
+ \quad 000000000000000000000000000000001 \\
\hline
1111111111111111111111111111111111
\end{array}
\]
50. Suppose that you’re connected to the Internet from home via a 56K dialup modem. (You’d upgrade to DSL, but you can’t bear to give up that sound that dialup modems make.) Unfortunately, you always achieve a download speed of just 40 Kbps. Suppose that you wanted to download a 15 MB file from some server in Redmond, Washington. How long will it take you to download this file? To receive credit, be sure to show your work!

51. Steve Jobs, Steve Wozniak, Steve Ballmer. . . . Why are so many bigwigs in the tech industry named Steve??