

1. Short Questions

The following questions are from all parts of the course.

(a) List all the acronyms we've encountered in the course and describe what each one means.

(b) What are the key elements of good user interface design? Give an example of using and breaking each one.

(c) Name at least three Internet protocols and describe what they are used for.

(d) Name at least two image file types.

(e) What is compiling? Are Java programs compiled? Are JavaScript programs compiled?

(f) Describe what the program `chmod` does, and list any arguments it requires.

(g) What is the difference between an array and a hash table? Give an example of how each was used in lab.

(h) Give the names of five people, including at least two women and two men, who made important contributions to computing and briefly describe their contributions (one sentence each).

2. Numbers and Numbering Systems

(a) Why is base 16 a useful compromise between base 10 and base 2? Why do computers like base 2? Why do computer scientists prefer base 16?

(b) Given a base B , what is the largest number expressible with three digits in that base, in terms of B ? (Hint: In base 10, the largest number expressible with three digits is 999.)

(c) [4 marks] Convert the following binary number to decimal and hexadecimal: 01000101

– Decimal:

– Hexadecimal:

(d) Add the following octal (base 8) numbers: $247 + 162$

3. HTML

Consider the following web page:

```
1. <html>
2. <head>
3. <title>Poetic Masterpieces
4. </head>
5.
6. <body>
7.
8. <table>
9.   <tr>
10.    <th>Authors</th>
11.    <th>Masterpieces</th>
12.  <tr>
13.    <td>Charles Baudelaire</td>
14.    <td>Flowers of Evil</td>
15.  </tr>
16.  <tr>
17.    <td>Arthur Rimbaud</td>
18.    </td>Illuminations</td>
19.  </tr>
20.  <tr>
21.    <td>Rainer Maria Rilke</td>
22.    <td>The Sonnets to Orpheus</td>
23.    <td>The Notebooks of Malte Laurids Brigge</td>
24.  </tr>
25. </table>
26.
27. </body>
28. </html>
```

(a) Find and fix the four errors contained in the code above.

(b) What does HTML stand for?

4. JavaScript

Consider the following javascript function:

```
1. <script language=javascript>
2. function foo(n) {
3.   var line, tab, i;
4.   line = "";
5.   i = 0;
6.
7.   while (i < n) {
8.     line += "*";
9.     i++;
10.  }
11.
12.  tab = "";
13.  i = 0;
14.
15.  document.writeln("<PRE>");
16.
17.  while (i < n) {
18.    tab += " ";
19.    document.writeln(tab + line);
20.    i++;
21.  }
22.
23.  document.writeln("</PRE>");
24.
25. }
26. </script>
```

(a) Explain what will happen if the function `foo` is called with an argument of 4.

(b) Briefly describe, in one sentence or less, the purpose of each of the following programming concepts:

- a comment:
- a variable declaration:
- a conditional:
- a loop:
- an assignment statement:
- a parameter declaration:

5. Algorithms

(a) Describe self-similarity.

(b) Describe why the binary search algorithm is generally faster than linear search algorithms.

(c) What key assumption does the binary search algorithm make about the input on which it operates?

(d) Create a Traveling Salesman Problem (TSP) graph from the following fragments: CCGAAT, ATCTGTA, and AATCCG.

(e) Find the least-cost path from the start to the finish in the above TSP graph.

6. How Computers Work

(a) What are ASCII and Unicode? How do they differ from each other?

(b) Consider the following 32 bit machine language instruction. Assume that the first set of bits (with 4 bits) indicates the name of an instruction. The second and third sets (with six bits each) indicate the registers used in the instruction. The fourth set (with 16 bits) indicates the address used in the instruction:



(i) How many different instructions can be expressed with this format?

(ii) Describe three different types of instructions that might be stored in a format like this. Write out specific examples of your instruction types (bit patterns), and explain what each means.

(c) What are the major components of a motherboard, and what do they do?

(d) What are the major components of a processor (CPU), and what do they do?

- (e) An OR gate takes two inputs. The gate outputs a one if either of the inputs has a value of one. It outputs zero only if both inputs are zero. Complete the truth table below to describe an OR gate.

A	B	F
0	0	
0	1	
1	0	
1	1	

- (f) **BONUS:** Using only NAND gates, construct a circuit that behaves like an OR gate. It should take two inputs, and its output should be as described in the above truth table. (Reminder: The output of a NAND gate is 0 if both of its inputs are 1, and 1 for all other input values.) (Hint: You can do this with exactly three NAND gates.)

7. AI and Psychology

(a) What is the Turing Test?

(b) What are some of the difficulties of natural language processing?

(c) What are the two main types of algorithms covered in class? Which type is based on how our brains function? Name one advantage this type has over the other.

8. Computers and Music

(a) Review music concepts.