CMPSCI 105 Midterm Exam Solution
Spring 2013
March 7, 2013
Professor William T. Verts

\<1\>   15 Points – (1 point each) – Fill in your answer into the box at the left side of each question. Show your work on the back of a page if you want us to consider partial credit. **Pick any 15 problems.** For extra credit, you may do more than 15.

FALSE	1. True or False: A 3½-inch diskette is a "hard disk". A hard disk is a hard metal platter with a magnetic surface, but a floppy diskette is a flexible plastic disk with a magnetic surface.
FALSE	2. True or False: A USB flash drive is a "hard disk". A flash drive has no moving parts, much less a rotating disk.
FALSE	3. True or False: All decimal fractions with a <u>fixed</u> number of digits can be converted to binary with a <u>fixed</u> number of bits. The decimal fraction $^1/_{10}$ = 0.1 has the binary expansion 0.00011001100110011001100… which repeats forever.
$2^5 = 32$	4. How many different binary patterns can be expressed with 5 bits?
$2^5-1 = 31$	5. What is the largest *unsigned* number that will fit into 5 bits? One of the 32 patterns is zero, so the largest value is one less = 31.
$2^{5-1}-1 = 2^4-1 = +15$	6. What is the largest *signed* number that will fit into 5 bits? Half the 32 patterns are negative, the other half range from 0…15.
$-2^{5-1} = -2^4 = -16$	7. What is the <u>smallest</u> *signed* number that will fit into 5 bits? The half of the 32 patterns that are negative range from -16…-1.
1201_3	8. Convert the decimal (base 10) number 46 into base 3. 46÷3=15R**1**, 15÷3=5R**0**, 5÷3=1R**2**, 1÷3=0R**1** (reverse order).
$6D_{16}$	9. Convert the binary (base 2) number 01101101_2 into *hexadecimal* (base 16) using the *bit-partitioning* method. Partitions: 0110 and 1101, converted to 6 and 13, or $6D_{16}$.
155_8	10. Convert the binary (base 2) number 01101101_2 into *octal* (base 8) using the *bit-partitioning* method. Partitions: 001, 101, and 101, converted to 1, 5, and 5, or 155_8.
10001100_2	11. What is the *sum in binary* (base 2) of the two binary numbers 01101001_2 and 00100011_2?
-1+9i	12. What is the *sum* of complex numbers **4+2i** and **-5+7i** ? Real: 4+ -5 = -1, Imaginary: 2i + 7i = 9i.
26+2i	13. What is the *product* of complex numbers **3-5i** and **2+4i** ? Partial products: 3×2=6, 3×4i=12i, -5i×2=-10i, -5i×4i=-20i^2=+20. Real: 6+20=26, Imaginary: 12i+ -10i=2i.
integer	14. Is the product of **(4+2i)** and **(4-2i)** an *integer*, *rational*, *irrational*, or *complex*? The imaginary components cancel out.

1.24082201	15. What is the logarithm, base 8, of the number 13.2? *See tables of logarithms in Templates and Reference Material.*
440	16. In the UNIX command `chmod` _____ `filename` what must be in the blank to set permissions to **r--r-----** ? *User and Group = `r--` = $100_2 = 4_8$, Others = `---` = $000_2 = 0_8$.*
o+rw	17. In the UNIX command `chmod` _____ `filename` what must be in the blank to add read and write permission to <u>others</u>?
.CA	18. Given a choice of servers holding identical files, should I download a large file from a server in **.CA** or from one in **.РФ**? *The code `.CA` is Canada, and `.РФ` (in Cyrillic) is the Russian Federation; Canada is closer to Massachusetts than Russia.*
EL507mqb	19. Mary Baker's username is **mqbaker** and her SPIRE ID number is **17320507**. What is her <u>initial</u> password on our server? *Capital `EL` followed by the <u>last</u> three digits of the ID number and the <u>first</u> three letters of the username in lowercase.*
Yes	20. Yes or No: Can I have a telnet (PuTTY, ssh) connection and an FTP (WinSCP, Fugu) connection open to the same account on the same server at the same time? *Happens all the time: packets from one program are interspersed with the packets of all the others.*

<2>   4 Points – Short Answer. You log in to the **elsrv3** server and immediately type in **emacs index.html**, but the editor screen comes up blank. Why? What's wrong?

You are in the wrong folder. The `index.html` file is in the `public_html` folder, but you are in your <u>home</u> folder when you first log in. Before starting emacs, you first need to type the UNIX command `cd public_html` (forgetting to do this was a common problem in labs #2 and #3).

<3>   8 Points – Trace the following gate circuit and show its output for all combinations of input values.
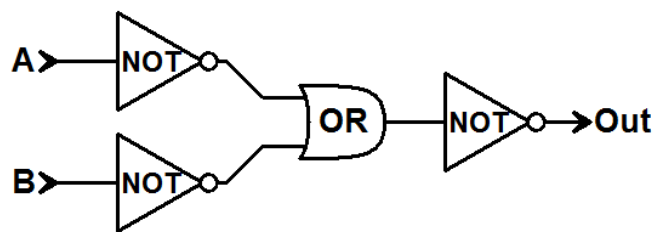
In		Output
A	**B**	
0	0	0
0	1	0
1	0	0
1	1	1

This circuit turns an OR-gate into an AND-gate. This is similar to the circuit on one of the quizzes, which turned an AND-gate into an OR-gate. Both use DeMorgan's Theorems to show that all we need to build computers are enough ORs and NOTs, or enough ANDs and NOTs, to build any other desired circuit.

<4>   8 Points – I want to create a Web color where the red component is at its <u>minimum</u> possible value, the green component is at its <u>maximum</u> possible value, and the blue component has decimal value 127.

The minimum possible color value is zero, or `00` in hex, and the maximum possible value is 255, or `FF` in hex. These are the limits of what can be stored in a single byte. The decimal value 127 is `7F` in hex, which can be obtained by the division method: $127 \div 16 = 7R15 = 7F$. Red = `00`, Green = `FF`, and Blue = `7F`.

A. (4 points) Fill in the blank below with the proper 6-digit hexadecimal code to correctly show this color as the background color:

`<BODY STYLE="background-color:#00FF7F">`

Don't forget the # symbol to indicate that the color is numeric!

B. Yes or No: is this color compatible with the "short hex" format?

NO. The `7F` does not have identical first and second digits.

C. What is the closest ***browser safe color*** to the answer in part A (again, use 6-digit hexadecimal)?

`#00FF66` (which is slightly closer than `#00FF99`).

D. What is the ***named color*** for your answer in part A?

Spring Green (see color names table in Templates and Reference Material).

<5>   3 Points – I am preparing a picture to use in my Web page. The image is a cartoon, is animated, contains 157 unique colors, and one color is to be transparent. Which file format (**`.BMP`**, **`.GIF`**, **`.JPG`**, **`.PNG`**, or **`.SVG`**) should I save the image in? There may be more than one correct answer.

`.GIF` only (`.BMP` are too big and don't support transparency, `.JPG` is lossy which is not suitable for cartoons that tend to have sharp color edges, neither `.BMP`, `.JPG`, or `.PNG` support animation, and `.SVG` isn't a pixel-based image format).

<6>   7 Points – I want to link to a <u>file</u> called **`Snakes and Lizards.html`** from the **`Slither`** directory <u>folder</u> of the <u>user</u> **`fzsmith`** on the **`elsrv3`** <u>server</u> we used in the first three lab assignments. What is the full, complete URL to this file?

`<A HREF="``http://elsrv3.cs.umass.edu/~fzsmith/Slither/Snakes%20and%20Lizards.html`**`">`**

Protocol & Host:	`http://elsrv3.cs.umass.edu/`
Username:	`~fzsmith/`
Folder Path:	`Slither/`
Filename:	`Snakes%20and%20Lizards.html`

<7>   5 Points – Examine the following four Web addresses. All are legal, but <u>none</u> of them specify the name of an actual resource to fetch. What <u>actual file</u> will the browser fetch in each case? (There is only a single answer to this question – the fetched file will have the same name in all four examples. What is the name of that file?)

```
http://www.umass.edu/
http://www.cs.umass.edu/
http://www.cs.umass.edu/~verts/
http://www.cs.umass.edu/~verts/garbage/
```

index.html

In all cases it is the default file, `index.html`, which is fetched. Each URL refers to a different `index.html` in a different place, but the file name is the same in all cases.

<8>   5 Points – Short Answer – Why is it a bad idea to telnet, or ftp for that matter, into Mordor?

Because Sauron will get your password with his packet sniffer!

For students not familiar with the Lords of the Rings story, I asked them to think of Mordor as "an evil place". The proper answer in both cases is that **traditional telnet and ftp programs are unencrypted**, which exposes all traffic (including usernames, passwords, credit card numbers, etc.) to packet sniffer programs. If those packet sniffers have been compromised, the bad guys will be able to record your sensitive information to use for their own purposes. This is why we use PuTTY, ssh, WinSCP, and Fugu instead, as they encrypt the contents of their packets. Packet sniffers can still determine if the packets are constructed properly, but they cannot decode their contents. For Frodo and the Shire!

<9>   5 Points – Short Answer – I want to join two Bézier Curves end-to-end, but the common end points and their corresponding control points are <u>not</u> all in a straight line. Do the two curves blend seamlessly into each other (that is, can you tell where one curve ends and the next begins?) Why or why not?

NO. Bézier curves are tangent to the line from each end point to its corresponding control point. If the common end points and their control points are not in a straight line, then the two relevant control lines are not the same. The curves are then tangent to two different lines, and at the common end points there is a discontinuity. Only when the two control lines are coincident will the two curves be tangent to the same line at the same point, blending smoothly from one into the other.

<10> 15 Points – Fill in the **STYLE** section so that the body of the Web page has a **PapayaWhip** background color and uses a background image called **Speckles.png**, and so that all **H3** headings are by default <u>centered</u> and have the color **#DDA0DD**.

Fill in the blanks as follows: The second **H3** heading must be **Blue** instead of the default color. The hypertext link must contain a complete URL to **www.snake.org** and the image is the file **My_Snake.jpg** (with the width set to 50 pixels and the alternate text set to **Lots of Slithering**). The copyright © symbol must appear in the correct blank. The last blank must contain the fraction $\frac{5}{9}$, properly typeset in HTML.

```
<HTML>
    <HEAD>
        <TITLE>My Spiffy Web Page</TITLE>

        <STYLE TYPE="text/css">

            BODY {background-color:PapayaWhip ;
                  background-image:url('Speckles.png') ;}

            H3   {text-align:center ;
                  Color:#DDA0DD; }

        </STYLE>
    </HEAD>

    <BODY>
        <H3>Welcome!</H3>

        <A HREF="http://www.snake.org/">

            <IMG SRC="My_Snake.jpg"

                 ALT="Lots of Slithering"

                 WIDTH="50">
        </A>

        <H3 STYLE="color:blue">Legal</H3>

        Copyright &copy; 2013 All Rights Reserved

        <SUP>5</SUP>&frasl;<SUB>9</SUB>-Baked
                                    Productions, Inc.
    </BODY>
</HTML>
```

<11> 10 Points – <u>Find and correct</u> all of the errors in the following **.SVG** file that cause it to fail to be displayed. There are <u>at least</u> ten mistakes. There will be a penalty of -1 point for each correct item misidentified as an error, but +½ point extra credit for each correctly found error more than ten. Remember that presentation attributes like **fill**, **stroke**, **stroke-width**, and **stroke-linejoin** are all <u>optional</u>, and the absence of one or more of these is not an error.

Red = delete, Green = insert, Blue= swap
I count around 24 errors, permitting up to 17 points.

```
<?xml verison="1.0" encoding="UTF-8" standalone="no"?>

<!-- Copyright 2013 William T. Verts -->

<svg
    xmlns:svg="http://wwww.w3.org/2000/svg"
    xm1lns:="http://www.w3.org/2000/svg"
    version="1.1"
    x="0px"
    y="0px"
    width="320px"
    hieght="240px">

    <rect
        x="0" y="0" width="320" height="140"
        fill="#00FFFF"/>

    <line x1="0" yl1="140" x2="320" y2="140"
        stroke="black" stroke-width="3"/>

    <polygon
        points="250,100 190,160 310,160 250,100"
        fill="#000080" stroke-line-join:"miter"
        stroke="#000000" stroke-width="3;"/>

    <circle
        cx="50" cy="40" r="20"
        fill="#FFFFF00"
        stroke="#000000"/>
</svg>
```

<12> 5 Points – Examine the picture of the sign to the right for the following questions.

1. The biggest letters are each around 1½ inches high. How many points is that?

   1½ inches × 72 points per inch = **108 points.**

2. On the picture, indicate by circling <u>all</u> places where ***kerning can be strongly applied*** (there are a couple of places where it may be questionable whether or not kerning could be applied; ignore those).

   PA and **AV** in PAVILION, **VA** in RESERVABLE, **VA** and **AT** in RESERVATIONS, **AV** in HAVE, **PA** in PARK, **AT** in AT, and possibly **DA** in DARK.

<13> 5 Points – For each typeface indicate whether it is ***monospaced*** or ***proportionally spaced.*** Also, indicate which have ***serifs*** and which are ***sans-serif***.

1. # Arial Black (Here is a little text.)

   Proportional, sans serif

2. ## Video Terminal Screen (A little text.)

   Monospace, serif

3. ## Comic Sans (Here is a little text.)

   Proportional, sans serif (the name is the clue!)

4. ## Times New Roman (Here is a little text.)

   Proportional, serif

5. ## Broadway (Here is a little text.)

   Proportional, sans serif

<14> 5 Points – Short Answer – Answer only <u>one</u> of the following questions on the back of this page. (No extra credit for answering more than one.) Please, no more than 5 sentences.

1. How are styles in Word *similar to* and *different from* styles as used in HTML Web pages?

   Both separate format from content – Word stores styles in `Normal.dotm` (or user-defined `.dotm` files), but HTML styles can be in a `<STYLE>` block or tags directly exposed in the document or in an external style sheet file with a `.css` file extension. Editing Word styles requires use of the style manager, but in HTML styles can be changed with any text editor.

2. Why is it important to know where the **Normal.dotm** file is located?

   You can delete it if it gets corrupted (Word will build a new file containing default styles). You can back it up to another file in case it does get damaged, and thus be able to restore your defined styles. You can copy your styles to a new machine.

3. How are Bézier curves important to typefaces?

   Outlines of characters are stored as Bézier (and similar) curves so that the characters can be scaled to any size.

4. Why should Word <u>not</u> be used to create Web pages?

   It creates huge and complicated `.html` files, plus a folder containing several associated files, all of which must be moved to the server.

5. Why is it useful to save a word processing file in **.PDF** format?

   You can email the `.PDF` or put it on the Web and know that everyone can read it, regardless of the package that was used to create the file. Also, with the full version of Adobe Acrobat you can set passwords to limit opening the file or copying/extracting its contents.