CSE-1520R

Test #1

Sur / Last Name:
Given / First Name:
Student ID:

- **Instructor:** Parke Godfrey
- **Exam Duration:** 45 minutes
- **Term:** Winter 2011

The exam is closed book, closed notes, and no aids such as calculators, cellphones, etc.

There are five parts, each with questions. Points for each question are as indicated. Each question is multiple choice, true/false, or fill in the blank, as indicated.

For multiple choice, choose the *one* best answer. There is no negative penalty for a wrong answer. Assume that any number you see is in decimal (base 10), unless it is clear otherwise.

The test is out of 50 points.

Marking Box	
1.	/10
2.	/10
3.	/10
4.	/10
5.	/10
Total	/50

1. (10 points) **Binary & Number Systems**

a. (2 points) You see the byte `01101010`. You know it represents

A. the ASCII character 'j'.
B. the natural number 106.
C. the negative integer −22
D. the floating point number 2.5.
E. *There is not enough information to determine.*

b. (2 points) A natural way to "store" positive and negative (signed) integers in a byte would seem be to use the most significant bit as a sign bit—say, 1 means positive and 0 means negative—and encode the magnitude of the integer in the remaining seven bits in direct binary representation.

This is not done, though, because

A. we are not allowed to use the most significant bit ever.
B. this encodes twice as many positive integers as negative, which is awkward.
C. addition would be impossible with this format.
D. zero would have two different representations.
E. one would have two different representations.

c. (2 points) Consider storing signed integers in 16 bits in two's complement format. The largest integer that can be represented is

A. 127
B. 128
C. 32,767
D. 32,768
E. 65,535
F. 65,536

d. (4 points) Fill in the blanks.

byte	format	value
`10101110`	hexadecimal	`AE`
`01011101`	8-bit floating point	$1\frac{5}{8}$
`00111000`	ASCII	8
`11111111`	8-bit signed integer, 2's complement	−1

2. (10 points) **Data Representation**

a. (2 points) Consider a 250×400 pixel image in RGB format with 8-bit depth per channel stored in BMP (a direct format with no compression or meta-data). The file size in bytes is

A. 1,000
B. 100,000
C. 300,000
D. 314,159
E. 1,000,000

b. (2 points) You encounter an ASCII file with the content

```
Yo, the best on the test!
```

(Ignore any linefeed or carriage return characters that might be in the file.)
What is the file's size in bytes?

A. 1
B. 20
C. 25
D. 40
E. 50

c. (2 points) Recording (analog) audio in a digital format requires

A. that one cap the frequency band, meaning it is necessarily lossy.
B. stereo, recording in *at least* two channels.
C. that one use decimal, *not* binary, representation.
D. that one record only the deltas between frames.
E. the MP3 format.

d. (4 points) Dr. Dogfurry gets an image file `mugshot.bmp` (284×207 pixels). BMP is a direct format with no compression or meta-data. He uses an image converter application to take the same image to put it into the JPG, PNG, and TXT formats (`mugshot.jpg`, `mugshot.png`, and `mugshot.txt`, respectively).

JPG does a decent, lossy compression.

PNG does moderate, lossless compression.

TXT represents the RGB values in ASCII for each pixel on a separate line, for easy reading. (E.g., `252,35: ( 40, 39, 37)  #282725  rgb(40,39,37)`.)

Match the likely file sizes (in bytes) to the file types.

bmp	C	**A.**	14,281
jpg	A	**B.**	110,164
png	B	**C.**	176,364
txt	D	**D.**	2,765,359

3. (10 points) **Gates & Circuits**

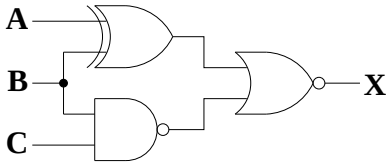

Figure 1: Logic diagram for a circuit.

a. (2 points) Consider the circuit in Figure 1. Fill in the blanks in the truth table.

A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

b. (2 points) Consider again the circuit in Figure 1. It is equivalent to which Boolean expression?

A. $(\mathbf{A} \cdot \mathbf{B}) \cdot (\mathbf{B} + \mathbf{C})'$
B. $((\mathbf{A} \oplus \mathbf{B}) + (\mathbf{B} \cdot \mathbf{C})')'$
C. $\mathbf{A} \cdot \mathbf{B} \cdot \mathbf{C}'$
D. $((\mathbf{A} + \mathbf{C})' \oplus \mathbf{B})$
E. 0

c. (2 points) Boolean gates (e.g., NAND) can be implemented in hardware with

A. binary
B. software
C. machine code
D. vacuum tubes
E. punch cards

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d. (2 points) *Combinational* circuits differ from *sequential* circuits in that

A. sequential circuits only use NOR's and NAND's.
B. combinational are implemented with transistors; sequential are not.
C. combinational are used to implement memory.
D. the output of a combinational circuit depends *both* on its input and the circuit's *state*.
E. the output of a sequential circuit depends *both* on its input and the circuit's *state*.

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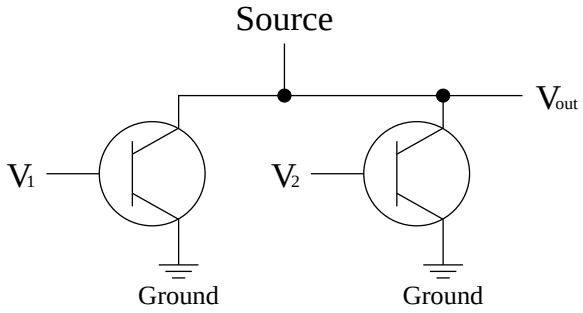
e. (2 points)



implements

A. an inverter
B. NOR
C. NAND
D. XOR
E. AND

4. (10 points) **File Systems**

a. (2 points) What is a named collection of data, used for organizing secondary memory, called?

A. a bit
B. a byte
C. a file
D. a directory
E. a disk

b. (4 points) Mark as *true* or *false* whether each of the following file types are likely *text* files (in ASCII or Unicode).

.java T
.doc F
.jpg F
.mp3 F

c. (2 points) An absolute *path* in the file system to a file is a list of the directory (folder) names—from the topmost directory down to the directory the file is in—followed by the file name.

In Microsoft Windows, what is the ASCII code in hexadecimal of the separator character used between the directory names in the path?

A. `20`
B. `21`
C. `2E`
D. `2F`
E. `5C`

d. (2 points) The directory that is not contained in any other directory is called

A. the source.
B. the root directory.
C. lonely.
D. dangling.
E. *Such a directory is not possible.*

5. (10 points) **Spread Sheets**

a. (2 points) Assume that in your spreadsheet in Excel, the cell `B3` contains the formula `=A2`. This formula is copied from cell `B3` and pasted into cell `D5`.

What will the formula look like in cell `D5`?

A. `=A2`
B. `=B3`
C. `=C4`
D. `=D5`
E. `=E6`

b. (2 points) A cell in a spreadsheet can contain

A. a formula.
B. a literal string.
C. a literal value.
D. *All of the above.*
E. *None of the above.*

c. (2 points) In Excel, the best style for formulas is to

A. use relative cell references.
B. use named ranges.
C. use absolute cell references.
D. use a mixture of types of cell references.
E. avoid formulas.

d. (2 points)

1	A	B	C	D
2		**Cost**	**Markup**	**Price**
3	cookies	$2.50	75%	$4.37
4	ice cream	$3.50	40%	$4.90
5	spinach	$2.95	15%	$3.39
6				

The column with Price is calculated from Cost and Markup.

What is the Excel formula you might have added to D3 to obtain this?

`=B3 * (1 + C3)`

e. (2 points) How might you best have applied the formula you added to D3 for Question 5d to apply also to D4 and D5?

A. It is not necessary. It applied to them automatically when I did D3.
B. The only way is to define the formula each time for each cell.
C. I have to modify the formula inside cell D3 to say it applies to D4 and D5 too.
D. If I *plus drag* over cells D3 to D5, it will auto-copy the formula into the new cells.
E. It is not possible.

INFORMATION.

ASCII

00 nul	01 soh	02 stx	03 etx	04 eot	05 enq	06 ack	07 bel
08 bs	09 ht	0A nl	0B vt	0C np	0D cr	0E so	0F si
10 dle	11 dc1	12 dc2	13 dc3	14 dc4	15 nak	16 syn	17 etb
18 can	19 em	1A sub	1B esc	1C fs	1D gs	1E rs	1F us
20 sp	21 !	22 "	23 #	24 $	25 %	26 &	27 ’
28 (	29)	2A *	2B +	2C ,	2D -	2E .	2F /
30 0	31 1	32 2	33 3	34 4	35 5	36 6	37 7
38 8	39 9	3A :	3B ;	3C <	3D =	3E >	3F ?
40 @	41 A	42 B	43 C	44 D	45 E	46 F	47 G
48 H	49 I	4A J	4B K	4C L	4D M	4E N	4F O
50 P	51 Q	52 R	53 S	54 T	55 U	56 V	57 W
58 X	59 Y	5A Z	5B [	5C \	5D]	5E ^	5F _
60 ‘	61 a	62 b	63 c	64 d	65 e	66 f	67 g
68 h	69 i	6A j	6B k	6C l	6D m	6E n	6F o
70 p	71 q	72 r	73 s	74 t	75 u	76 v	77 w
78 x	79 y	7A z	7B {	7C |	7D }	7E ~	7F del

8-bit floating point number:

- *sign*: most significant bit (left-most)
  0 for plus, 1 for minus
- *exponent*: next three bits, stored in excess notation
- *mantissa*: four bits
  must begin with 1

SCRATCH SPACE.

RELAX. TAKE A DEEP BREATH. TURN IN YOUR TEST.