Name (print): ________________________________________

- **INSTRUCTIONS:**
  - Keep your eyes on your own paper, and do your best to prevent anyone else from seeing your work.
  - Do NOT communicate with anyone other than the professor/proctor for ANY reason in ANY language in ANY manner.
  - This is exam is closed book, closed notes, no calculator, and no computer.
  - Turn all mobile devices off and put them away now. You cannot have them on your desk.
  - Write neatly and clearly. What I cannot read, I will assume to be incorrect.
  - Stop writing immediately when told to do so at the end of the exam. I will take 5 points off your exam if I have to tell you multiple times to do so.
  - Academic misconduct will not be tolerated and will be referred immediately to the Emory Honor Council. Penalties for misconduct will be a zero on this exam, an F grade in the course, and/or other disciplinary action that may be applied by the Emory Honor Council.

- **TIME:** This exam has 8 questions on 10 pages including the title page. Please check to make sure all pages are included. You will have 75 minutes to complete this exam.

---

_I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Emory community. I have also read and understand the requirements and policies outlined above._

Signature: ________________________________________

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points:</td>
<td>7</td>
<td>11</td>
<td>12</td>
<td>14</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>75</td>
</tr>
<tr>
<td>Score:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. (7 points) **DON’T KNOW MUCH ABOUT HISTORY (OF COMPUTERS)**.
   Match the people on the right with their contribution to Computer Science on the left. Write a letter from the right hand column in a blank next to the person left hand column. You will **not** use all the options in the right hand column.

<table>
<thead>
<tr>
<th></th>
<th>Ada Lovelace</th>
<th>(a) Inventor who worked on automated machines including the digesting duck and automated looms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Charles Babbage</td>
<td>(b) Coined the term “bug” and developed the first compiler.</td>
</tr>
<tr>
<td>g</td>
<td>Grace Hopper</td>
<td>(c) Invented the transistor.</td>
</tr>
<tr>
<td>b</td>
<td>John von Neumann</td>
<td>(d) Built the first mechanical calculator.</td>
</tr>
<tr>
<td>f</td>
<td>Alan Turing</td>
<td>(e) Invented the mouse.</td>
</tr>
<tr>
<td>i</td>
<td>Jacques de Vaucanson</td>
<td>(f) Originated the idea of storing programs along with data in computer memory.</td>
</tr>
<tr>
<td>a</td>
<td>Douglas Englebart</td>
<td>(g) Invented the Difference and Analytical Engines.</td>
</tr>
<tr>
<td>e</td>
<td>“Father” of theoretical computer science who worked as a cryptographer during World War II.</td>
<td></td>
</tr>
<tr>
<td>j</td>
<td>Wrote the first program to calculate Bernoulli numbers on the analytical engine.</td>
<td></td>
</tr>
</tbody>
</table>
2. (11 points) (Fill In The) Blank Check
   (a) Give an example of operating system software.
       (a) Linux, Windows, Mac OSX
   (b) Give an example of applications software.
       (b) FF, web browsers, etc
   (c) Give an example of a computer input device.
       (c) mouse, keyboard, microphone
   (d) Give an example of a computer output device
       (d) monitor, speakers/sound card, printer
   (e) Give an example of nonvolatile storage.
       (e) hard or USB drive, CD/DVD, ROM
   (f) 4096 bits is equal to how many bytes?
       (f) 512
   (g) What is the term for the interconnecting wires and rules for data transmission in a computer?
       (g) bus
   (h) Moore’s Law states that the capacity to pack electronic circuitry will double every how many years?
       (h) 2 years
   (i) In Excel, text values are aligned while numbers are aligned in the display.
       (i) left, right
   (j) The process of the output of one function being used as input to another function, such as \(=\text{SUM}(\text{A1}, \text{AVERAGE}(\text{A2:A4}))\) is known as ______.
       (j) nesting
   (k) True or False: Excel is case sensitive when writing formulas using functions, cell addresses, and names. In other words, using the formula \(=\text{SUM}(\text{A1}, \text{average}(\text{a2:A4}))\) will cause errors due to the mismatched case.
       (k) false
3. (12 points) **Conjunction Junction What’s Your Function**
Given the spreadsheet below, evaluate each of the following formulas. If the formula will generate an error, you can simply write “error”. You do not need to specify the type of error. **Use quotation marks to clearly differentiate text from numbers.**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>te</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>st</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>xt</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>tepid</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>tepppid</td>
</tr>
</tbody>
</table>

(a) =A1&B2
(b) =MID(B4, 3, 2)
(c) =LEFT(B2)*A1
(d) =MOD(A5,A4)
(e) =INT(A5/A3)
(f) =(2*A4+A5)/A2
(g) = (2*SUM(A4:A5))/A2
(h) =SUM(A2:A5)/A1
(i) =ISTEXT(RIGHT(A4))

(a) “0st”
(b) “pi”
(c) error
(d) 0
(e) 2
(f) 10
(g) 15
(h) error
(i) TRUE
(j) =SEARCH("p", B5)

(j) 3

(k) =LEN(B5)

(k) 7

(l) =IF((2*A4)>=A5, A2+A3, A3)

(l) 18
4. ALL YOUR BASE (NUMBERING SYSTEMS) ARE BELONG TO US

(a) (8 points) Find the equivalent decimal numbers for the following numbers. If the number is invalid for the given base, write “invalid”.

i. $356_8$
   
   i. $238$

ii. $110011_2$
   
   ii. $51$

iii. $321_4$
   
   iii. $57$

iv. $522_5$
   
   iv. invalid

(b) (6 points) Write the equivalent binary (base 2) number for the following decimal numbers. If the number is invalid in a base 10 numbering system, write “invalid.”

i. $22_{10}$
   
   i. $10110_2$

ii. $41_{10}$
   
   ii. $101001_2$
5. **Short Answer.** Give a brief (2-3 sentence) answer to the following questions.

(a) (2 points) Why was the Jacquard Loom considered an important predecessor of the modern computer?

**Solution:** It was “programmable”. You could program it to weave a pattern of cloth using punched cards. This lead to the idea of general purpose machines having multiple functions/capabilities via programming by humans.

(b) (3 points) Explain the difference between Relative, Absolute, and Mixed Referencing. Give an example of each in Excel notation.

**Solution:** relative addressing uses position of cell and referenced cell to calculate formula’s evaluation when copied to other cells. Ex: A1  
absolute: does not change when formula is copied to another cell/range. Ex: $A$1  
mixed: column or row remains fixed as in absolute addressing, but row or column is allowed to vary as in relative addressing. Ex: $A1$ or A$1$

(c) (3 points) You have a spreadsheet with a large list of persons and their contact information. However, the list is unorganized, and names appear in random order. Describe what you would need to do so that you can search the list using a divide and conquer problem solving strategy. Clearly explain why your approach would allow a divide and conquer strategy to be effective.

**Solution:** You would want to sort the data so that the names are alphabetically listed. Then, when you looked up a name, you would only have to examine half the list and could narrow your list of possible locations for the name by 50% each time. Thus the problem is divided in half at each step until you find the answer.
6. (8 points) **You Can’t Handle The Truth (Table).**

The formula \( \text{OR(AND(A1,NOT(B1)), AND(NOT(C1),OR(A1,B1)))} \) is entered into cell D1. This formula is then copied and pasted into cells D2:D8. Fill in the table below with the appropriate values for cells D1:D8.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>2</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>3</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>4</td>
<td>FALSE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>5</td>
<td>TRUE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
<tr>
<td>6</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>7</td>
<td>TRUE</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>8</td>
<td>TRUE</td>
<td>TRUE</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
<tr>
<td>9</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
</tbody>
</table>

**Solution:**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
<tr>
<td>2</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>3</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>4</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>5</td>
<td>FALSE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>6</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>7</td>
<td>TRUE</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>8</td>
<td>TRUE</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>9</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
</tbody>
</table>
7. (A Formula For) Love, Death, and Taxes
You are building a spreadsheet to tell people what tax form they should use: either the 1040 or the 1040EZ. To do this, you have information about a person’s age, marital status (single or married), whether they claim dependents, and their income. A person may use form 1040EZ only if all of the following apply:

- he/she is single.
- he/she is not older than 65.
- he/she does not claim dependents.
- he/she earns does not earn more than $50,000/year.

Age and Income are both integers, while Marital Status and Dependents are represented by Boolean values (see the data formatting below). Further, you may assume that each range in the spreadsheet can be referenced by the Name which is the same as the header given in Row 1.

(a) (4 points) Write four different valid Excel conditions representing whether or not a person meets each of the four different criteria (listed above) to be able to use Form 1040EZ. Note: you only need to write the conditions for the criteria above. You do not need to write a full Excel formula.

Solution: Only had to write conditions, not entire formulas. These conditions could be used in any formula that requires them, such as IF, SUMIF, etc.

\[
\text{Age} \leq 65 \\
\text{Single} \\
\text{NOT(Dependents)} \\
\text{Income} \leq 50000
\]

(b) (3 points) Write a single Excel formula which will evaluate to TRUE if a person must use Form 1040 and FALSE if they may use Form 1040EZ because they meet all of the criteria above.

Solution: Answers vary, but some might be:

\[
\begin{align*}
&=\text{NOT(AND(Age} \leq 65, \text{ Single, NOT(Dependents), Income} \leq 50000)) \\
&=\text{IF(AND(Age} \leq 65, \text{ Single, NOT(Dependents), Income} \leq 50000), \text{ FALSE, TRUE}) \\
&=\text{OR(Age} > 65, \text{ NOT(Single), Dependents, Income} > 50000)
\end{align*}
\]
8. **Go With The Flow (Chart)**:

We can calculate the commission rate for a salesperson, given the amount of sales he/she makes. When the salesperson has sold less than or equal to $2000 worth of goods, the commission is 2%. When the sales total is more than $2000 but less than or equal to $4000, the commission is 4%. When the sales total is more than $4000 but less than or equal to $6000, the commission is 7%. When the person has sold more than $6000, the commission is 10%.

(a) (4 points) Draw the flowchart representing the logic to determine the commission percentage a saleperson should receive, given the total sales amount.

**Solution:**

![Flowchart](chart.png)

(b) (3 points) Write an Excel formula to calculate the correct commission percentage. You may assume that the sales total can be referenced using the named range `Total`.

**Solution:** `answer varies =IF(Total<=2000, .02, IF(Total<=4000, .04, IF(Total<=6000, .07, .1)))`

(c) (1 point) Write an Excel formula to calculate the salesperson’s pay. You may assume that the sales total can be referenced using the named range `Total`. Further, you may assume that the calculation you did in Part b can be referenced by the named range `Commission`.

**Solution:** `=Total*Commission`