Final Exam, Version 3
CSci 127: Introduction to Computer Science
Hunter College, City University of New York

20 December 2017

Exam Rules

- Show all your work. Your grade will be based on the work shown.

- The exam is closed book and closed notes.

- When taking the exam, you may have with you pens, pencils, and an 8 1/2" x 11" piece of paper filled with notes, programs, etc.

- You may not use a computer, calculator, tablet, smart watch, or other electronic device.

- Do not open this exam until instructed to do so.

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

| I understand that all cases of academic dishonesty will be reported to the Dean of Students and will result in sanctions. |
|---|
| Name: |
| EmpID: |
| Signature: |

1. (a) What will the following Python code print:

```python
flist = "speech,worship,want,fear,fdr"
freedoms = flist.split(",")
pres = freedoms[-1]
print(pres.upper())
num = flist.count(",")
print(num, "Freedoms")
for i in range(0,4):
    if i < 2:
        print("\tof", end=" ")
    else:
        print("\tfrom", end=" ")
    print(freedoms[i])
```

Output:
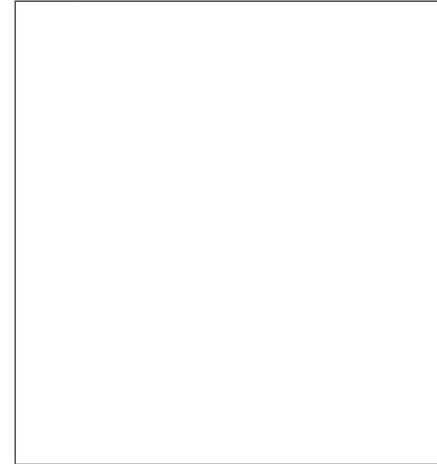
(b) Consider the following shell commands:

```
$ ls
hw1.py      hw2.py      hw3.py      turtle.py
```

     i. What is the output for:

Output:

```
$ mv t*.py mock.py
$ mkdir programs
$ ls
```

     ii. What is the output for:

Output:

```
$ cp hw1.py t.py
$ mv hw*.py programs
$ ls
```

2. (a) Fill in the missing values in the table:

Decimal	Binary	Hexadecimal
3		3
	110	6
	1011	B
33	100001	
254	11111110	

(b) Fill in the code below to make an image in which a pixel is red if it has an entry of 0 in the array `elevations`. Otherwise, the pixel should be colored blue.

```python
# Takes elevation data of NYC and displays coastlines
import numpy as np
import matplotlib.pyplot as plt
elevations = np.loadtxt('elevationsNYC.txt')
#Base image size on shape (dimensions) of the elevations:
mapShape = elevations.shape + (3,)
floodMap = np.zeros(mapShape)

for row in range(mapShape[0]):
    for col in range(mapShape[1]):




#Save the image:
plt.imsave('floodMap.png', floodMap)
```

3. (a) What is the value (True/False) of out:

    i.
    ```
    in1 = False
    in2 = True
    out = in1 and in2
    ```
    out =

    ii.
    ```
    in1 = False
    in2 = False
    out = in1 or (in2 or not in1)
    ```
    out =

    iii.
    ```
    in1 = True
    in2 = True
    in3 = (in1 or in2)
    out = in1 and not in3
    ```
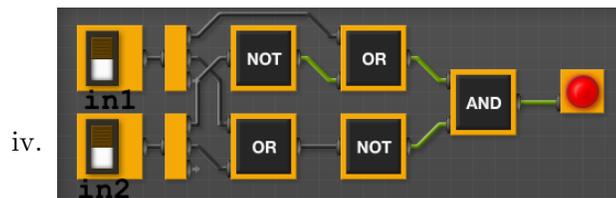   out =

    iv.

    ```
    in1 = False
    in2 = True
    ```
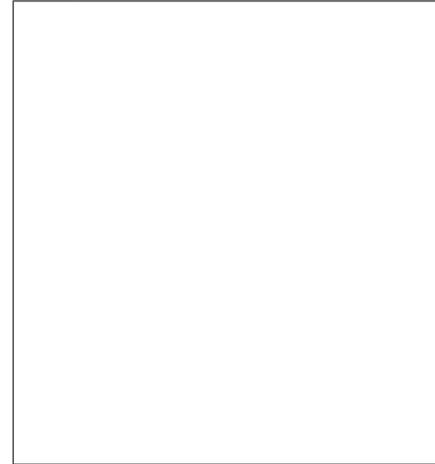   out =

   (b) Design a circuit that takes three inputs and returns true when one or more of the inputs are true. Otherwise if returns false.

4. (a) Draw the output of the program:

```
#turtle mystery
import turtle

tess = turtle.Turtle()
for i in range(6):
    if i%2 == 0:
        tess.stamp()
    tess.forward(100)
    tess.left(60)
```

Output:

(b) What is the output:

```
#Another mystery program...
#mystery
def shift(num):
    num = num + 1
    if num > ord('z'):
        num = ord('a')
    return chr(num)

def enigma(letters):
    mess = ""
    for l in letters:
        n = ord(l)
        c = shift(n)
        mess = mess + c
    return mess


word = input("Enter a word: ")
s = enigma(word)
print("Output is:", s)
```

i. When the user enters: **'h'**?

Output:

ii. When the user enters: **'ktu'**?

Output:

iii. When the user enters: **'oxsgnm'**?

Output:

5. Write a **complete Python program** that will read:

   - prompt the user for the name of a CSV file,

   - prompt the user for the name of a column in that CSV file, and

   - print out the minimum value and average of the column.

6. Write a **complete Python program** that asks the user for the name of a .png (image) file and displays the upper right quarter of the image.

For example if the image is `hunterLogo.png` (left), the displayed image would be (right):

7. Complete the following Python program, which creates a turtle, prompts the user for a string, and then controls the turtles actions:

   - 'F': moves the turtle forward
   - 'L': turns the turtle 90 degrees to the left
   - 'R': turns the turtle 90 degrees to the right

   That is, write the functions `setUp()`, `getInput()`, and `doAction()`:

```python
import turtle
def main():
    t = setUp()      #creates a green turtle
    s = getInput()  #get string from user
    for action in s:
        doAction(t,action)  #Do 'F', 'L', or 'R'

if __name__ == "__main__":
    main()
```

8. (a) What are the values of register, $s0, and output for the run of this MIPS program:

```
#Set up counters:
ADDI $s0, $zero, 3
ADDI $s1, $zero, 1
AGAIN: ADDI $sp, $sp, -3
ADDI $t0, $zero, 72 # H
SB $t0, 0($sp)
ADDI $t0, $zero, 105 # i
SB $t0, 1($sp)
ADDI $t0, $zero, 0  # (null)
SB $t0, 2($sp)
ADDI $v0, $zero,50 #50 is for printing message
ADDI $a0, $sp, 0
syscall
SUB $s0, $s0, $s1
BEQ $s0, $zero, AGAIN
```

Values of $s0: [ ]   **Output:** [ ]

(b) Write a MIPS program that prints the letter 'H' 10 times:

9. What is the output of the following C++ programs?

(a)
```cpp
//Neil deGrasse Tyson
#include <iostream>
using namespace std;
int main()
{
    cout << "There is no greater";
    cout << "education\n than one";
    cout << "that is self-driven\n";
}
```

Output:

(b)
```cpp
//Mystery C++, #2
#include <iostream>
using namespace std;
int main()
{
  int count = 3;
  while (count <= 25) {
    cout << count;
    count = count * 2;
  }
}
```

Output:

(c)
```cpp
//Mystery C++, #3
#include <iostream>
using namespace std;
int main()
{
  for (int i = 0; i < 5; i++) {
    for (int j = 5; j > i; j--) {
      if (i % 2 == 0)
        cout << "+";
      else
        cout << "-";
    }
    cout << endl;
  }
}
```

Output:

10.   (a) Write a **complete Python program** that prompts the user to enter a string. If the user enters an empty string, your program should continue prompting the user for a new string until they enter a non-empty string. Your program should then print out the string entered.

       (b) Write a **complete C++ program** that asks the user for a number and prints "Negative" if the number entered is less than 0, "Zero" if it equals 0, and "Positive" otherwise.