Final Exam, Version 4
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.

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:

```
wList = "Mon&Tues&Wednes&Thurs&Fri&Satur&Sun"
weeks = wList.split("&")
tgit = weeks[3]
print(tgit.upper())
print(weeks[-1])
for i in range(0,6,2):
    day = weeks[i]+"day"
    print(i,day)
```

Output:

(b) Consider the following shell commands:

```
$ ls
map.html   map.py   p10.py
```

i. What is the output for:

```
$ cp p10.py p11.py
$ mkdir maps
$ ls
```

Output:

ii. What is the output for:

```
$ mv p10.py map2.py
$ mv m*.*   maps
$ ls
```

Output:

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

Decimal	Binary	Hexadecimal
4		4
	101	5
14	1110	
32	100000	
	11111111	FF

(b) Fill in the code below to make an image in which a pixel is blue if it has an entry of 10 or less in the array `elevations`. Otherwise, the pixel should be colored green.

```
# Takes elevation data of NYC and displays storm surge map
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 = True
in2 = False
out = in1 and in2
```
out =

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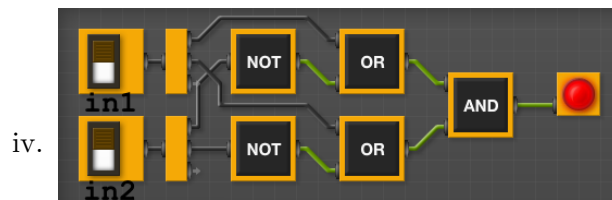out =

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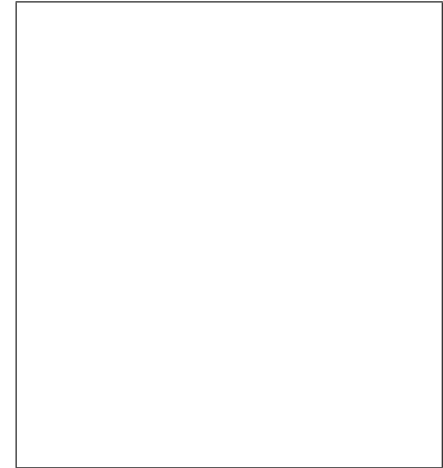out =

iv.

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

(b) Design a circuit that takes three inputs and returns true when two 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(8):
    if i%2 == 0:
        tess.stamp()
    tess.forward(100)
    tess.left(45)
```

Output:

(b) What is the output:

```
#Another mystery program...
#mystery
def dub(num):
    send = chr(num)
    if num < ord('k'):
        send = send + send
    return send

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

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

i. When the user enters: `aa`?

Output:

ii. When the user enters: `cab`?

Output:

iii. When the user enters: `alice`?

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 maximum value and the 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 lower left 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 asks the user for the number of turtles to create and creates them. Then, repeats 10 times, moving each turtle in the list forward and stamping. That is, write the functions `getInput()`, `moveForward()`, and `stamp()`:

```python
#Intro Programming Lab:  A program with herd of turtles
import turtle
def setUpTurtles(n):
    tList = []
    #Create turtles:
    for i in range(n):
        t = turtle.Turtle()
        t.shape("turtle")
        tList.append(t)
    return tList
def main():
    num = getInput()                #Ask for number of turles
    turtleList = setUpTurtles(numTurtles) #Make a list of num turtles
    for i in range(10):             #Repeat 10 times
        moveForward(turtleList) #Move each turtle in the list forward
        stamp(turtleList)       #Stamp where the turtle stopped
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, -4
ADDI $t0, $zero, 66 # B
SB $t0, 0($sp)
ADDI $t0, $zero, 121 # y
SB $t0, 1($sp)
ADDI $t0, $zero, 101 # e
SB $t0, 2($sp)
ADDI $t0, $zero, 0 # (null)
SB $t0, 3($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 'B' 10 times:

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

(a)
```cpp
//Eleanor Roosevelt
#include <iostream>
using namespace std;
int main()
{
   cout << "Do one thing, every " << endl;
   cout << "day,\n that";
   cout << "scares you.\n";
}
```

Output:

(b)
```cpp
//Mystery C++, #2
#include <iostream>
using namespace std;
int main()
{
  int sum = 1;
  while (sum < 10) {
    cout << sum;
    sum = sum + sum;
  }
}
```

Output:

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

Output:

10. (a) Write a **complete Python program** that prompts the user to the year they were born. If the user enters a number larger than 2017, your program should continue prompting the user until they enter a number less than or equal to 2017. Your program should then print out the number entered.

(b) Write a **complete C++ program** that asks the user for a number and prints "Days" if the number entered is less than 7, "Week" if the number is exactly 7, and "More" otherwise.