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

Fall 2017

Answer Key:

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

```
months = ["Jan","Feb","Mar","Apr","May",\
"Jun","Jul","Aug","Sep","Oct","Nov","Dec"]
half = months[6]
print(half.upper())
print(half[0])
print(months[-1].lower())
print(months[2:4])
start = 9
print(months[start-1])
term = 3
print(months[(start+term-1)%12])
```

Answer Key:

```
JUL
J
dec
[’Mar’, ’Apr’]
Sep
Dec
```

(b) Consider the following shell command and resulting output:

```
ls t*
t.html           test.png            trash.html        turtle2.py
tc.htmk          testSubprocess.py   trashCans.csv     turtle3.py
tc.html          th.html             triangles.py
```

```
test:
herd.py           makeDirs*     projectFiles/
```

i. What is the output for:
`ls t*.png`

Answer Key:

```
test.png
```

ii. What is the output for:
`ls t* | grep ".p" | sort`

Answer Key:

```
herd.py
test.png
testSubprocess.py
triangles.py
turtle2.py
turtle3.py
```

2. (a) After executing the Python code, write the name of the turtle:

```
import turtle
turtle.colormode(255)

apple = turtle.Turtle()
apple.color(0,0,0)

banana = turtle.Turtle()
banana.color(255,255,255)

cherry = turtle.Turtle()
cherry.color("#AA00AA")

date = turtle.Turtle()
date.color("#0000FF")
```

i. which is white:

Answer Key:

`banana`

ii. which is black:

Answer Key:

`apple`

iii. which is the brightest blue:

Answer Key:

`date`

iv. which is purple:

Answer Key:

`cherry`

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

```
# Takes elevation data of NYC and displays a 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]):
```

Answer Key:

```
        if elevations[row,col] <= 0:
            #Below sea level
           floodMap[row,col,2] = 1.0     #Set the blue channel to 100%
        else:
            #Above sea level
            floodMap[row,col,1] = 1.0   #Set the green channel to 100%

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

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

i.

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

Answer Key:

```
out = False
```

ii.

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

Answer Key:

```
out = False
```

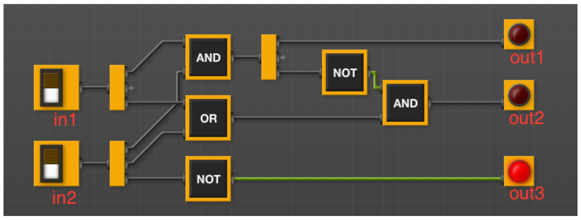
iii.

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

Answer Key:

```
out = False
```

iv.

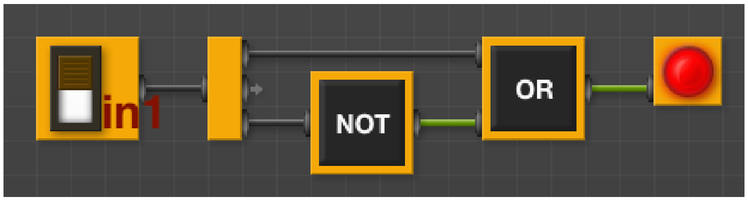


```
in1 = False
in2 = False
```

Answer Key:

```
out1 = False
out2 = False
```

(b) Design a circuit that takes a single input and always outputs True.

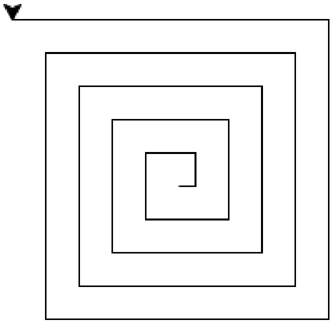
Answer Key: 

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

```
#Mystery program...
import turtle

tH = turtle.Turtle()

for i in range(10,255,10):
    tH.color((i,i,i))
    tH.forward(i)
    th.left(90)
```



Answer Key:

(b) What is the output:

```
#Another mystery program...
def rest(s, num):
    b = 16
    while b > 0.5:
        if num >= b:
            s = s + "1"
        else:
            s = s + "0"
        num = num % b
        b = b / 2
    return(s)
def convert(n):
    returnS = ""
    if n < 0:
        returnS = rest("1", n+32)
    else:
        returnS = rest("0", n)
    return(returnS)
n = int(input("Enter a number: "))
s = convert(n)
print("Output is", s)
```

i. When the user enters: `2`?

Answer Key: `Output is 000010`

ii. When the user enters: `31`?

Answer Key: `Output is 011111`

iii. When the user enters: `-1`?

Answer Key: `Output is 111111`

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 average and standard deviation.

Answer Key:

```
#Computes average and standard deviation of inputted column
import pandas as pd

fileName = input(’Enter file name: ’)
colName = input(’Enter column name: ’)
df = pd.read_csv(fileName)
ave = df[colName].mean()
std = df[colName.std()
print("Average is ", ave)
print("Standard deviation is ", std)
```

6. Using `folium` and `pandas`, write a **complete Python program** that asks the user for the name of a CSV file, name of the output file, and creates a map with markers for all the 311 complaints from the input file.

Answer Key:

```
#Collisions program
import folium
import pandas as pd

inF = input('Enter CSV file name: ')
outF = input('Enter output file: ')
df = pd.read_csv(inF)

map311 = folium.Map(location=[40.768731, -73.964915], tiles="Cartodb Positron",zoom_start=

for index,row in df.iterrows():
    lat = row["LATITUDE"]
    lon = row["LONGITUDE"]
    name = row["TIME"]
    newMarker = folium.Marker([lat, lon], popup=name)
    newMarker.add_to(map311)

map311.save(outfile=outF)
```

7. Complete the following Python program, which creates a green turtle, draws a decagon (10-sided figure) to the window, and then prints a closing message. That is, write the functions `setUp()`, `drawDecagon()`, and `conclusion()`:

```
import turtle

def main():
    t = setUp()      #creates a green turtle
    drawDecagon(t)   #draws a decagon using the turtle
    conclusion()     #prints goodbye

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

Answer Key:

```
def setUp():
    trey = turtle.Turtle()
    trey.color("green")
    return(trey)

def drawDecagon(t):
    for i in range(10):
        t.forward(100)
        t.right(360/10)

def conclusion():
```

```
print("Goodbye!")
```

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

```
#Sample program that loops from 10 down to 0
ADDI $s0, $zero, 10 #set s0 to 10
ADDI $s1, $zero, 2  #use to decrement counter, $s0
AGAIN: SUB $s0, $s0, $s1
BEQ $s0, $zero, DONE
J AGAIN
DONE:  #To break out of the loop
```

Values of $s0:

Answer Key:

```
10
8
6
4
2
0
```

(b) Write a MIPS program where the register, `$s0` loops through the values: `1,2,3,4,5`

Answer Key:

```
#Program that loops from 1 upto 5
ADDI $s0, $zero, 1  #set s0 to 1
ADDI $s1, $zero, 1  #use to increment counter, s0
ADDI $s2, $zero, 5 #set s2 to use for comparison
AGAIN: ADD $s0, $s0, $s1
BEQ $s0, $s2, DONE
J AGAIN
DONE:  #To break out of the loop
```

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

(a)

```
//Mystery C++
#include <iostream>
using namespace std;
int main()
{
   cout << "Get your education" << endl;
   cout << "Don't forget from ";
   cout << "whence you came\n";
}
```

Answer Key:

```
Get your education
Don’t forget from whence you came
```

(b)

```
//Mystery C++, #2
#include <iostream>
using namespace std;
int main()
{
  int count = 0;
  while (count < 8) {
    cout <<"The world turned upside down\n";
    count = count + 2;
  }
}
```

Answer Key:

```
The world turned upside down...
The world turned upside down...
The world turned upside down...
The world turned upside down...
```

(c)

```
//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 (j % 2 == 0)
        cout << "+";
      else
        cout << "-"
    cout << endl;
  }
}
```

Answer Key:

```
-+-+-
-+-+
-+-
-+
-
```

10. (a) Write a **complete Python program** that prompts the user to enter 5 numbers and prints out the total of the numbers entered.

Answer Key:

```
#Asks for 5 numbers and prints total
total = 0
for i in range(5):
   n = float(input('Enter a number: '))
   total = total + n
print("Total is", total)
```

(b) Write a **complete C++ program** that repeatedly prompts the user for a number until one that is strictly larger than 0 is entered. Your program should print out the final number the user entered.

Answer Key:

```
//Checks input for positive number
#include <iostream>
using namespace std;
int main()
{
  cout << "Please enter age: ";
  int age = 0;
  cin >> age;
  while (age < 0) {
    cout << "You entered a negative number.\n";
    cout << "Please enter age: ";
    cin >> age;
  }
  cout << "You entered your age as: " << age;
  return 0;
}
```