

**MOCK EXAM**  
CSCI 127: Introduction to Computer Science  
Hunter College, City University of New York

December 05, 2023

**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.

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

```
THURS
Sun
0 Monday
2 Wednesday
4 Friday
```

- (b) Consider the following shell commands:

```
$ ls -l *z*
-rw-r--r--@ 1 user  staff      5308 Mar 21 14:38 quizzes.html
-rw-r--r--  1 user  staff     54013 Mar 20 18:57 zoneDist.csv
-rw-r--r--@ 1 user  staff      1519 Mar 22 15:14 zoneMap.py
-rw-r--r--  1 user  staff   16455174 Mar 20 19:02 zoning2.html
-rw-r--r--  1 user  staff   17343896 Mar 20 18:58 zoningIDS.json
```

- i. What is the output for:

```
$ ls -l *z* | grep ".html"
```

**Output:**

```
quizzes.html
zoning2.html
```

- ii. What is the output for:

```
$ ls -l *z* | grep ".html" | wc -l
```

**Output:**

2
---

2. (a) Select the correct option.
- What color is tina after this command? `tina.color(103, 103, 103)`  
 black       red       white       gray       green
  - Select the LARGEST Binary number:  
 1011       1101       0111       1010       0110
  - Select the LARGEST Hexadecimal number:  
 AA       EA       EF       FC       CD
  - What is the binary number equivalent to decimal 9?  
 1011       1001       1100       1010       1110
  - What is the hexadecimal number equivalent to decimal 43?  
 34       A2       B4       2B       CD
- (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]):
```

```
        if elevations[row, col] <= 10:
            floodMap[row, col, 2] = 1.0
        else:
            floodMap[row, col, 1] = 1.0
```

```
#Save the image:
plt.imshow("floodMap.png", floodMap)
```

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

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

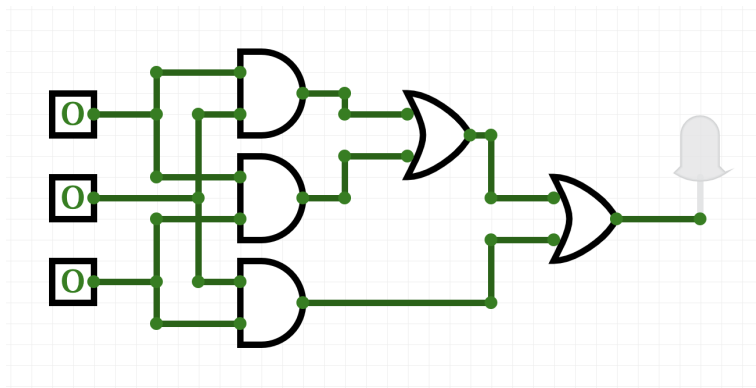
out =

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

out =

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

out =

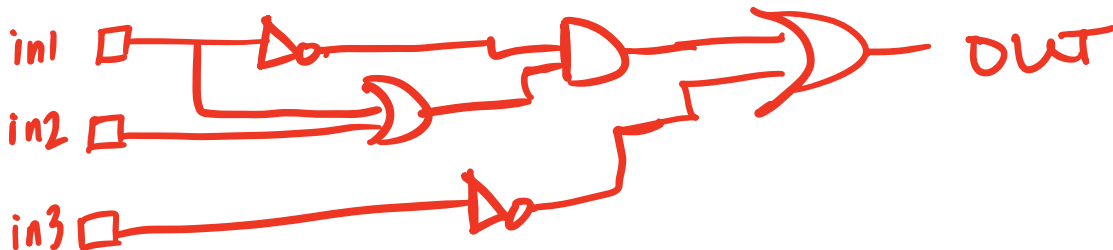


iv.  
 in1 = False  
 in2 = False  
 in3 = False

out =

(b) Design a circuit that implements the logical expression:

$((\text{not } in1) \text{ and } (in1 \text{ or } in2)) \text{ or } (\text{not } in3)$

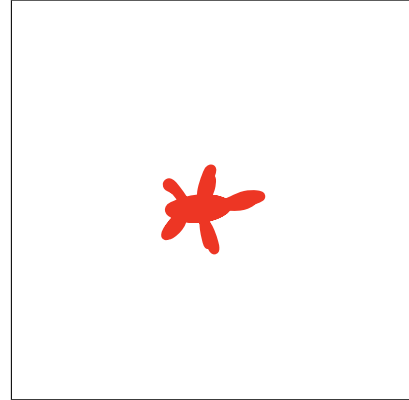


4. (a) Draw the output for the function calls:

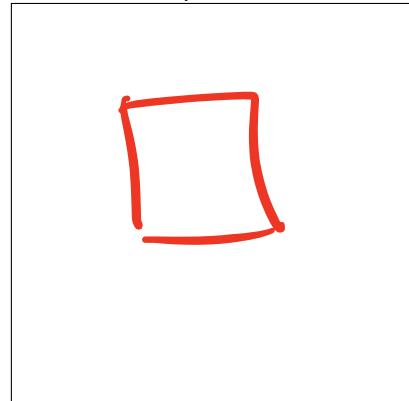
```
import turtle
tess = turtle.Turtle()
tess.shape("turtle")

def ramble(t,side):
    if side == 0:
        t.stamp()
    else:
        for i in range(side):
            t.forward(50)
            t.left(360/side)
```

- i. `ramble(tess,0)`



- ii. `ramble(tess,4)`



- (b) What is the output:

```
#Another mystery program...
#mystery
def mystery(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 = mystery(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:**

aaaa

- ii. When the user enters: `cab`?

**Output:**

ccaabb

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

**Output:**

aaliccee

5. Write a **complete Python program** that asks the user for numbers (separated by spaces) and prints the how many end in 5.

For example:

- If the user entered: 101 15 50 645
- Your program should print: 2

```
#Counting numbers ending in 5
```

```
numbers = input("Enter numbers: ")
num = numbers.count("5 ")
if numbers[-1] == "5":
    num += 1
print("Number of numbers ending in 5 is", num)
```

6. Fill in the following functions that are part of a program that analyzes NYC Urban Forest of street trees (from NYC OpenData):

- `getData()`: asks the user for the name of the CSV file and returns a DataFrame of the contents.
- `totalTrees()`: returns the number of trees (`length`) in the DataFrame, and
- `biggestDiameter()`: returns the largest diameter (`tree_dbh`) in the DataFrame.

```
import pandas as pd
def getData():
    """
    Asks the user for the name of the CSV and
    Returns a dataframe of the contents.
    """
    fileName = input("Enter file name: ")
    df = pd.read_csv(fileName)
    return(df)
```

```
def totalTrees(df):
    """
    Takes a DataFrame as input.
    Returns the length of the DataFrame.
    """
    length = len(df)
    return(length)
```

```
def biggestDiameter(df):
    """
    Takes a DataFrame as input and
    Returns the maximum value in
    the column, tree_dbh.
    """
    M = df["tree_dbh"].max()
    return(M)
```

7. 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):



```
#Import the packages for images and arrays:
import matplotlib.pyplot as plt
import numpy as np

inF = input("Enter file name: ")
img = plt.imread(inF) #Read in image from inF

height = img.shape[0] #Get height
width = img.shape[1] #Get width
print(height,width)

img2 = img[height//2:, :width//2] #Crop to the bottom left Lower left corner

plt.imshow(img2) #Load our new image into pyplot
plt.show() #Show the image (waits until closed to continue)
```



8. (a) Consider the following MIPS program:

```

ADDI $s0, $zero, 1
ADD $s1, $s0, $s0
ADD $s2, $s1, $s1
ADD $s3, $s2, $s2

```

After the program runs, what is the value stored in:

- i. register \$s1

2
---

- ii. register \$s2

4
---

- iii. register \$s3

8
---

- (b) What is the output for a run of this MIPS program:

**Output:**

<b>FGHIJK</b>
---------------

```

#Loop through six letters:
ADDI $sp, $sp, -7           # Set up stack
ADDI $t0, $zero, 70        # Start $t0 at 70 (F)
ADDI $s2, $zero, 76        # Use to test when you reach 76 (L)
SETUP: SB $t0, 0($sp)      # Next letter in $t0
ADDI $sp, $sp, 1           # Increment the stack
ADDI $t0, $t0, 1           # Increment the letter
BEQ $t0, $s2, DONE         # Jump to done if $t0 == 76
J SETUP                    # If not, jump back to SETUP for loop
DONE: ADDI $t0, $zero, 0    # Null (0) to terminate string
SB $t0, 0($sp)            # Add null to stack
ADDI $sp, $sp, -6         # Set up stack to print
ADDI $v0, $zero, 4        # 4 is for print string
ADDI $a0, $sp, 0          # Set $a0 to stack pointer for printing
syscall                   # print to the log

```

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

```

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

```

(a)

**Output:**

```

Do one thing, every
day,
  thatscares you.

```

```

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

```

(b)

**Output:**

```

1248

```

```

//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;
}

```

(c)

**Output:**

```

+++++
-----
+++++
-----
+++++

```

10. (a) Write a **complete C++ program** that asks the user for the year they were born. If they enter a number before 1900, the program continues to ask for the year they were born. The program then prints the year that was entered.

---

```
#include <iostream>
using namespace std;

int main() {
    int year;
    do {
        cout << "Enter year born: ";
        cin >> year;
    } while (year < 1900);

    return 0;
}
```

---

- (b) Write a **complete C++ program** that prints the change in population of the state of New Jersey:

$$p = p + Bp - Dp$$

where  $p$  is the population,  $B$  is the birth rate of 12 births for every 1000 people ( $\frac{12}{1000}$ ) each year, and  $D$  is the death rate of 7.8 for every 1000 people ( $\frac{7.8}{1000}$ ). In 2021, the population of New Jersey was 9.27 million. Your program should print expected population for the years 2021 to 2030. Each line should have: the year and the population (in millions).

---

```
#include <iostream>
using namespace std;

int main() {
    float popNJ = 9.27;
    for (int i = 2021; i <= 2030; i++) {
        cout << i << "\t" << popNJ << endl;
        popNJ += popNJ*(12.0/1000) - popNJ*(7.8/1000);
    }

    return 0;
}
```

---