

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

December 10, 2024

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, smartwatch, 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.

Name: Melissa Lynch

EmpID:

Signature:

ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	c
4	4	[END OF TRANSMISSION]	36	24	\$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

(Image from wikipedia commons)

1. (a) **What will the following Python code print?** *Note that each section is run sequentially, so the commands from part i will affect part ii and so on.*

i. `apples = "Honeycrisp;Pink Lady"`
`print(apples.find(";"))`

Output:

10

ii. `apples += ";Gala"`
`aList = apples.split(";")`
`print(len(aList))`

Output:

3

iii. `low = aList[1].lower()`
`print(ord(low[0]))`

Output:

112

iv. `for apple in aList:`
`print(apple.count("a"))`

Output:

0
1
2

- (b) Consider the contents of the current directory, `/Users/John`:

```
bison.csv lion.txt parrot.csv zebra.py zoo
```

Note that each section is run sequentially, so the commands from part i will affect part ii and so on.

- i. What is the output for:

```
$ ls *on*
```

Output:

bison.csv lion.txt

- ii. What is the output for:

```
$ mv *.csv ./zoo
$ ls
```

Output:

lion.txt zebra.py zoo

- iii. What is the output for:

```
$ cd ./zoo
$ pwd
```

Output:

/Users/John/zoo

2. Complete the Python program below that creates a topographic map. Your program should first ask the user for the amount of red.

The pixels of the image should be colored as follows:

If the elevation is less than or equal to 0, color the pixel the amount of red the user specified.

If the elevation is divisible by 5, color the pixel black.

Otherwise, the pixel should be colored white.

The resulting image should be displayed to the user after all the pixels are colored.

```
import numpy as np
import matplotlib.pyplot as plt

elevations = np.loadtxt("elevationsNYC.txt")

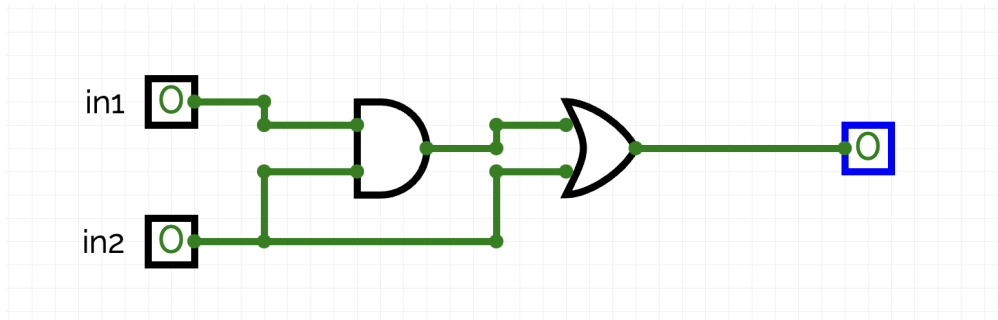
mapShape = elevations.shape + (3,)
topoMap = np.zeros(mapShape)

#YOUR CODE HERE
red = float(input("Enter value:"))
for row in range (mapShape [0]):
    for col in range (mapShape [1]):
        if elevations [row, col] <= 0:
            topoMap [row, col, 0] = red
        elif elevations [row, col] % 5 == 0:
            topoMap [row, col, :] = 0.0
        else:
            topoMap [row, col, 0] = 1.0
            topoMap [row, col, 1] = 1.0
            topoMap [row, col, 2] = 1.0
```

3. (a) Select the correct option.
- What color is tina after this command? `tina.color("#0000DD")`
 green gray white red blue
 - Select the LARGEST binary number:
 1011 1000 0111 0010 1001
 - Select the SMALLEST hexadecimal number:
 96 8A 9F AD CE
 - What is the binary number equivalent to the decimal number ~~20?~~ 19?
 01011 10010 11100 10111 10011
 - What is the hexadecimal number equivalent to the decimal number 60?
 34 32 2C 3C 3D

- (b) i. What is the value (True/False):

- in1 = True
A. in2 = False
out =
out = (not (in1 and in2)) and in2
- in1 = True
B. in2 = False
out =
out = not (in1 and (in2 or in2))
- in1 = True
C. in2 = False or in1
in3 = (in1 and in2) or True
out =
out = in2 and not in3



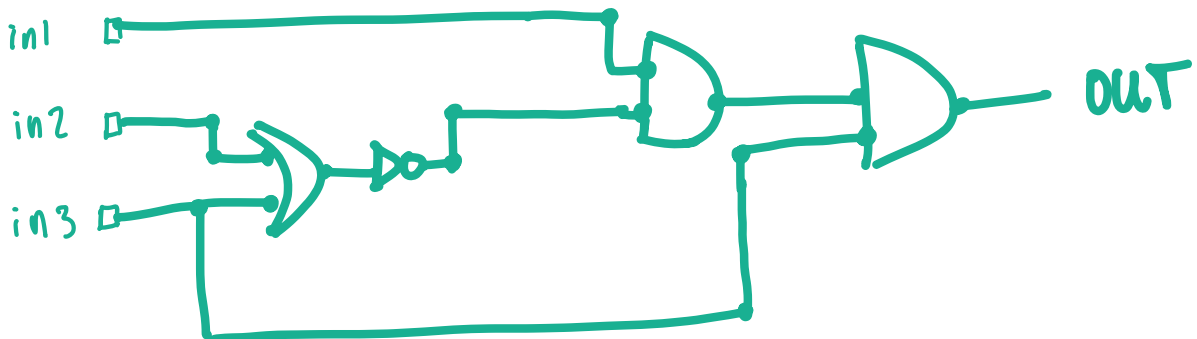
(c)

Write a logical expression equivalent to the circuit above.

$$\text{out} = (in1 \text{ and } in2) \text{ or } in2$$

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

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



4. Write a Python program to make a turtle walk 100 times. Each “walk” is 30 steps forward. The turtle should turn left 0, 10, 20, . . . , 350 degrees (chosen randomly) at the beginning of each walk.

```
import turtle  
import random
```

```
tina = turtle.Turtle()
```

```
for i in range(100):  
    degrees = random.randrange(0, 351, 10)  
    tina.left(degrees)  
    tina.forward(30)
```

5. Consider the following dataset:

Temperature	Luminosity	Radius	Absolute magnitude	Star type	Star color	Spectral class
3068	0.0024	0.17	16.12	Brown Dwarf	Red	M
3042	0.0005	0.1542	16.6	Brown Dwarf	Red	M
2600	0.0003	0.102	18.7	Brown Dwarf	Red	M

Assume this data is stored in `stars.csv`

- (a) Write a Python program that finds the hottest star in the dataset and prints its temperature in Fahrenheit. The temperature data is originally in Kelvin. The formula to convert Kelvin to Fahrenheit is $F = \frac{9}{5}(K - 273.15) + 32$, where K is the degrees in Kelvin and F is the degrees in Fahrenheit.

```
import pandas as pd
df = pd.read_csv("stars.csv")
max_temp = df["Temperature"].max()
F = 9/5 * (max_temp - 273.15) + 32
print(F, "degrees Fahrenheit")
```

- (b) Write a Python program that prints the average luminosity of the "Supergiant" star type.

```
import pandas as pd
df = pd.read_csv("stars.csv")
star_groups = df.groupby("Star type")
supergiants = star_groups.get_group("Supergiant")
print(supergiants["Luminosity"].mean())
```


6. Consider the following main function:

```
import matplotlib.pyplot as plt
import numpy as np

def main():
    blueImg = makeBlue(10,20)
    plt.imshow(blueImg)
    plt.show()
```

Define the function below:

```
def makeBlue(height, width):
    """
    Takes in two integers as input, creates an all-blue image with
    the given dimensions, and then returns the image
    """
```

```
blue = np.zeros( ( height, width, 3 ) )
blue[:, :, 2] = 1.0
return blue
```

7. Write a complete Python program that asks the user for the name of an image file and prints the number of pixels that are mostly purple in that image. A pixel is mostly purple if the amount of red and blue are both above 0.75 and the amount of green is below 0.25.

```
import numpy as np
import matplotlib.pyplot as plt
```

```
filename = input("Enter image file:")
```

```
img = plt.imread(filename)
```

```
purple_count = 0
```

```
for row in range(img.shape[0]):
```

```
    for col in range(img.shape[1]):
```

```
        if (img[row, col, 0] > 0.75) and (img[row, col, 1] < 0.25) and (img[row, col, 2] > 0.75):
```

```
            purple_count += 1
```

```
print("Number of mostly purple pixels:", purple_count)
```

8. (a) Consider the following MIPS program:

```

ADDI $s1, $zero, 300
ADD $s2, $s1, $s1
ADDI $s2, $s2, 10
ADDI $s3, $s2, 50

```

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

- i. register \$s1

300

- ii. register \$s2

610

- iii. register \$s3

660

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

Output:

FGHIJK

```

#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. Translate the following Python program into a complete C++ program:

```
start,end = (0,0)

while start >= end:
    start = int(input("Enter a number:"))
    end = int(input("Enter a number:"))

while start < end:
    print(start)
    start += 1
```

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

```
int main() {
    int start = 0;
    int end = 0;
    while (start >= end) {
        cout << "Enter a number: ";
        cin >> start;
        cout << "Enter a number: ";
        cin >> end;
    }
    while (start < end) {
        cout << start << "\n";
        start ++;
    }
    return 0;
}
```

10. Write a complete C++ program that prints the first 10 numbers of the Fibonacci sequence using a for-loop. Use the following pseudocode to implement your main function:

1. Declare three integers: a, b, and c. Initialize a to 0 and b to 1.
2. Print out a and then b, separated by newline characters
3. For i = 2, 3, 4, ... , 9:
 - c = a + b
 - Print c followed by a newline
 - a = b
 - b = c

```
#include <iostream>
```

```
int main() {
```

```
    int a = 0;
```

```
    int b = 1;
```

```
    std::cout << a << "\n" << b << "\n";
```

```
    for (int i = 2; i < 10; i++) {
```

```
        c = a + b;
```

```
        std::cout << c << "\n";
```

```
        a = b;
```

```
        b = c;
```

```
    }
```

```
    return 0;
```

```
}
```