CSC 3320: System-Level Programming **50 Points**

Homework 3

© Instructor: Dr. Md. Mahfuzur Rahman **Fall 2024**

Work on the following problems and submit your own answers. You are allowed to discuss with other students. However, do not copy the solutions from peers or other sources. If the assignment has any programming component, your program(s) must compile with **gcc** and execute on **snowball.cs.gsu.edu**! Please see https://cscit.cs.gsu.edu/sp/guide/snowball for more details.

Instructions:

- Upload an electronic copy (MS word or pdf) of your answer sheet to the folder named "HW3" in iCollege.
- Add the course number, homework number, and your name at the top of your answer sheet.
- Write down your answers with the question number only in the answer sheet.
- Use of ChatGPT or other generative models is strictly prohibited. You may receive 0.
- Name your file in the format of CSC3320_HW3_FisrtnameLastname (.docx/.pdf)
- Deadline: Submit by October 24, 2024, 11:59 pm

1. i) (3 points) Consider the following `scanf` call:

```
scanf("%f%d%f", &a, &b, &c);
```

If the user enters 12.3 45.6 128, what will be the value of `a`, `b`, and `c`. Note that `a` and `c` are `float`-type variables and `b` is an `int` variable. Support your answer with appropriate explanation.

ii) (3 points) Determine the output of the following fragment. Explain how.

```
i = 10; j = 5;
printf("%d ", i++ - ++j);
printf("%d %d", i, j);
```

iii) (3 points) Determine the output of the following fragment. Explain how.

```
i = 7;
j = 3 + --i * 2;
printf("%d %d", i, j);
```

2. (5 points) What output the following fragment will produce? Explain why. How would you re-write the fragment if you wanted the intended output (i.e. "one")?

```
i=1;
switch (i % 3) {
    case 0: printf("zero");
    case 1: printf("one");
    case 2: printf("two");
}
```

3. (5 points) Write a single expression whose value is either -1, 0, or + 1, depending on whether i is less than, equal to, or greater than j , respectively with and without using conditional operator.

4. (5 points) Is the following `if` statement syntactically correct?

```
if (n >= 1 <= 10)
    printf("n is between 1 and 10\n");
```

   If so, what does it do when n is equal to 0?

5. (4 points) What does the following code produce? Explain in detail.

```
for (i = 5, j = i - 1; i > 0, j > 0; --i, j = i - 1)
    printf("%4d ", i);
```

6. (5 points) What output the following code fragment will produce? Explain in detail.

```
sum = 0;
for (i = 1; i <= 20; i++) {
    if (!(i % 3))
       continue;
    sum += i;
}
printf("%d\n", sum);
```

7. (3 points) Rewrite the following loop so that its body is empty. Explain your answer.

```
for (n = 0; m > 0; n++)
    m /= 2;
```

8. (4 points) The following function is supposed to return `true` if any element of the array `a` has the value 0 and `false` if all elements are nonzero. Sadly, it contains an error. Find the error and show how to fix it:

```
bool has_zero(int a[], int n)
{
    int i;

    for (i = 0; i < n; i++)
        if (a[i] == 0)
            return true;
        else
            return false;
}
```

   Explain your answer in detail.

9. (5 points) What will be the output of the following program? Modify the swap function so that it can swap without using `temp` variable.

```
#include <stdio.h>
void swap(int a, int b);

int main(void)
{
    int i = 5, j = 10;

    swap(i, j);
    printf("i = %d, j = %d\n", i, j);
    return 0;
}
```

```
void swap(int a, int b)
{
    int temp = a;
    a = b;
    b = temp;
}
```

10. (5 points) Trace the execution of the following function by hand (attach screenshots of your trace work). Then write a program that calls the function, passing it a number entered by the user. What does the function do?

```
void pb(int n)
{
    if (n != 0) {
        pb(n / 2);
        putchar('0' + n % 2);
    }
}
```

11. (2 points (bonus)) The Fibonacci numbers are 0, 1, 1, 2, 3. 5, 8, 13, ..., where each number is the sum of the two preceding numbers. Write a program fragment that declares an array named `fib_num bers` of length 40 and fills the array with the first 40 Fibonacci numbers using iterative approach (loops). `Hint:` Fill in the first two numbers individually, then compute the rest.

    i) (3 points (bonus)) Write a recursive function to solve the above problem.

    You must also submit your `.c` files. Please check on `snowball.cs.gsu.edu` if your code executes normally.

Question:	1	2	3	4	5	6	7	8	9	10	11	Total
Points:	9	5	5	5	4	5	3	4	5	5	0	50
Bonus Points:	0	0	0	0	0	0	0	0	0	0	5	5
Score:												