

UID:

Mid Term 2 : CSE 173

Name:

Handed on Saturday: 04-09-2021 at 11:20 AM
Due on Thursday: 04-09-2021 at 12:40 PM

Answering Guideline

1. Scan the answer script with name and ID on the top sheet and submit the scanned version with file name (**id_firstName.pdf**).
2. You may consult textbooks and online sources. However, for online sources, make sure they are authentic sources, such as they are from journal papers, conference papers or technical notes from well-known associations (IEEE, ACM, etc.). If you give online references, please mention the sources.
3. It is not allowed to consult with any person who has knowledge of this subject, including other students of this course. You may ask question to the instructor if you do not understand the question, but not more than that. All solutions have to be your own work.
4. You must show all work for each problem to receive full credit.

CODE OF HONOR PLEDGE

I pledge on my honor that I have not given or received any unauthorized assistance on this assignment.

Signature

Date

Answer any 6 of the following questions

1. Give a steps count and give a big-O estimate of the algorithm. (*hint: $n = x.length$*) **10**

```
int do_it(int [] x)
{
    int i,j;
    int count =0;
    for(i=0;i<x.length;++i) {
        for(j=0;j<i;++j) {
            if(x[i] + x[j]<0)
                count+=1;
        }
    }
    return count;
}
```

2. Show that $f(x) = 5x^2 + x + 1$ is $O(x^2)$ with suitable C and k. **10**
3. Let $f(x) = 3x + 2$ and $g(x) = x^2$ be functions defined on the integers ($f: \mathbb{Z} \rightarrow \mathbb{Z}, g: \mathbb{Z} \rightarrow \mathbb{Z}$). Find the Big O estimate of $g \circ f$. **10**
4. Prove that $1 + 2 + \dots + n = \frac{n(n+1)}{2}$ by induction **10**
5. Prove by induction that $1 + 2 + 2^2 + 2^3 + \dots + 2^n = 2^{n+1} - 1$ whenever n is a nonnegative integer. **10**
6. Give a recursive definition of $S_m(n) = m + n$, the sum of the integer m and the nonnegative integer n . **10**
7. Find the value of a_4 if $a_1 = 1$, $a_2 = 2$, and $a_n = a_{n-1} + a_{n-2} + \dots + a_1$ **10**
8. Suppose that there are 27 students in discrete mathematics class. Show that the class must have at least 14 male students or at least 14 female students. **10**