

# CSE 312 1. Midterm

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## I. QUESTION (20 POINTS)

Give a big-Oh characterization, in terms of  $n$ , of the running time of the following subprograms. Show your work.

a.)

```
int f(int n){
    if (n > 1){
        System.out.println("Continue");
        f (n / 2);
        f (n / 2);
    }
}
```

b.)

```
int algorithmB(int n){
    if (n > 0){
        sayi1 = algorithmB (n - 1);
        sayi2 = algorithmB (n - 1);
        return sayi1 + sayi2;
    } else
        return 0;
}
```

## II. QUESTION (20 POINTS)

Give a big-Oh characterization, in terms of  $n$ , of the running time of the following subprograms. Show your work.

a.)

```
sum = 0\\
for p = 0 to n do\\
    for q = 0 to n-p do\\
        sum = sum + 1\\
```

b.)

```
m = 0\\
for a = 1 to n do\\
    for b = 1 to a do\\
        for c = 1 to b do\\
            m = m + 1
```

## III. QUESTION (20 POINTS)

Write a brute force algorithm that takes an array A as input and determines whether it contains two numbers whose sum is  $K$ .

## IV. QUESTION (20 POINTS)

Write a divide-and-conquer algorithm that takes as input a number  $N$  and determines whether it is a square, that is, whether it can be written as  $q^2$  for some integer  $q$ . You can not use sqrt function.

## V. QUESTION (20 POINTS)

A sequence of  $n > 0$  integers is called a jolly jumper if the absolute values of the differences between successive elements take on all possible values 1 through  $n - 1$ . For instance, 1 4 2 3 is a jolly jumper, because the absolute differences are 3, 2, and 1, respectively. The definition implies that any sequence of a single integer is a jolly jumper. Write an algorithm that takes an array A as input and determines if the numbers in the array constitute a jolly jumper.