BRAC University (Department of Computer Science and Engineering)
CSE 221 (Algorithm) for Spring 2025 Semester
Quiz 1 (Set A)

Student ID:
Section: **Full Marks: 20**
Name: **Duration: 30 minutes**

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1. Given a program, write down the time complexity.   5

```
int i, j, k, a, b, sum
for ( i = 0; i < n; i = i + 3)
      for ( j = n; j >= 1; j = j / 5)
            for ( k = 1; k <= n; k = k * 5)
                  sum = a + b
```

2. Given a program, write down the time complexity.   4

```
for i in range(1, n):
    j = 1
    while j < i*i:
        j = j + 1
```

3. You are given a sorted binary array **arr** of length n, where each element is either **0** or **1**. The array is sorted in **non-decreasing** order, meaning that all 0s appear before any 1s. Your task is to find the **number of 1s** in the array in less than O(N) time complexity.

Example: arr = [0, 0, 0, 1, 1, 1, 1]   Output: 4

Propose an algorithm for this task.   4

4. You have recently joined Facebark as a software engineer. It's a new social media platform where people share pictures of their dogs. There is a newsfeed where posts by Facebark friends appear. Each user has a numerical ID. You are trying to figure out the order of the newsfeed posts. There have been numerous complaints about users who spam the platform by posting a thousand pictures simultaneously. Therefore, you came up with an idea: the posts by users will be shown in ascending order of their post counts. So, you printed the data of the counts of the newest posts:

id	0	1	2	3	4	5	6	7	8	9
post count	8	12	3	5	2	17	9	14	2	3

After looking at the data, you thought, "Oh, easy! I can write a linear time algorithm for this!"

a. Describe the algorithm by showing the steps of how you would sort the above list in linear time.   5

Two days after this implementation, the entire server crashed after running out of memory. You found out that this happened after a few users uploaded 1000 pictures each. But people uploaded thousands of pictures regularly before and this never happened.

b. Do you think the crash was a result of your sorting algorithm? If the answer is yes, provide a possible explanation about how this could have happened.   2

Student ID:
Section: **Full Marks: 20**
Name: **Duration: 25 minutes**

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1. Given a program, write down the time complexity   5

```
int i, j, k, m, a, b, sum
for (i=0; i<n; i+=4) {
    for (j=1; j<n; j*=2) {
        for (k=0; k<30; k++) {
            sum += a
        }
        print("Done");
        for (m=n; m>0; m-=2) {
            Sum += b
        }
    }
}
```

2. Given a program, write down the time complexity.   4

```
for (i = n / 2; i > 1; i /= 6) {
    for (j = 2; j <= i; j *= 4) {
        for (k = 0; k <= j; k *= 3) {
            p = p + n / 2;
        }
    }
}
```

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Example: arr = [0, 0, 0, 1, 1, 1, 1]   Output: 4

Propose an algorithm for this task.   4

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