BRAC University (Department of Computer Science and Engineering)

CSE 221 (Algorithms) for Spring 2025 Semester

Quiz 1

Student ID:
Section:

Full Marks: 20

Name:

Duration: 20 minutes

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1. Write the time complexity of the following code snippet. Show your works/reasoning. **(5 marks)**

Code:

```
sum1 = 0;
for (k=1; k<=n; k++)
        for (j=1; j<=k; j++)
                sum1++;
for (i=1; i<=n; i++)
        a[i] = i;
```

$\rightarrow O(n^2)$

$\rightarrow O(n)$

$\rightarrow O(n^2)$

2. Write the time complexity of the following code snippet. Show your works/reasoning. **(5 marks)**

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

i	$j = j+1$ executes
1	$0 = (1-1)$ times
2	$3 = (2^2-1)$ times
3	$8 = (3^2-1)$ times
⋮	
$n-1$	$(n-1)^2-1$ times

$$\sum_{1}^{n-1} k^2 - (n-1)\cdot 1$$

$$\rightarrow \frac{(n-1)\,n\,\{2(n-1)+1\}}{6} - (n-1) = \frac{(n-1)\,n\,(2n-1)}{6} - (n-1)$$

$O(n^3) \leftarrow = \frac{n^3}{3} - \frac{n^2}{2} - \frac{5n}{6} + 1$

3. Consider an 2D sorted array with m rows and n columns. Your task is to check if an item is in the 2D array or not. Now, write an efficient pseudocode or program with time complexity O(log m + log n) to find the row and column of an item in this 2D array. If the item is not in the 2D array the program should print -1. **10 marks**

similar to:
https://www.geeksforgeeks.org/search-element-sorted-matrix/