

GIT Department of Computer Engineering
CSE 222/505 - Spring 2015
Homework 02
Due date: February 31 2016 – 16:00 AM

1. Calculate the running time of the function below. Assume that your function is implemented
 - by using array list
 - by using linked list

Show your calculation in most convenient notation. (Big O/Teta/Omega)

```
BUBBLESORT(A)
1  for i = 1 to A.length - 1
2      for j = A.length downto i + 1
3          if A[j] < A[j - 1]
4              exchange A[j] with A[j - 1]
```

2. Sort the following functions from slowest to fastest in terms of their growth.

$n^{2.56}$, $\log(n!)$, $n \log n$, $\log \log n^2$

3. Prove using only the definitions of asymptotic notations
 - n^2 is in $O(2^n)$
 - $n!$ is in $\Omega(2^n)$
 - $\log n$ is in $\Theta(\log_{64} n)$
4. Prove that $2n^2 - 4n + 9 = \Theta(n^2)$ using induction.
5. Is Big-O an equivalence relation? Show classes and prove your answer.
6. Calculate the running time of the loops below.
 - for (int i = 1 ; i < n^2 ; i+=5)
 print()
 - for (int i = 0 ; i < 2n ; i+=3i)
 for (int j = 0 ; j < i ; j++)
 if (j = target) break;
 else print()
7. The program in below lasts 8 second, when the the input size of the algorithm is 10. What is the working time while problem size is 160, on the same computer?

```
// Input : an integer
// Output : an integer
Function myFun(n)
{
    count = 0
    for i=1 to log n
        for j=i to i+5
            for k=1 to i*i
                count = count + 1
    return count
}
```

Note: Do not email your homework or submit it through moodle. Your submissions will be handwritten.

CONTACT : Teacher Assistant : Şeyma Yücer - Lab – 118 – syucer@bilmuh.gyte.edu.tr