CSE 321 Homework 1

Due date: 25 / 10 / 2019

1-) Answer in detail the questions that are shown below by using asymptotic notations, yes / no answers and plagiarizing from the web will not be accepted.

a) Is the following statement scientifically sound? :"The running time of algorithm A is at least $O(n^2)$"?
b) Are the following true?
   i) $2^{n+1} = O(2^n)$?
   ii) $2^{2n} = O(2^n)$?
c) Let f (n) and g(n) be asymptotically nonnegative functions. Is the equation: max(f (n), g(n)) = Θ(f(n) + g(n)) true?

2-) In each of the following situations, indicate whether f ϵ O(g), or f ϵ Ω(g), or both (in which case f ϵ Θ(g)).

	f(n)	g(n)
a)	$n^{1.01}$	$n\log^2 n$
b)	n!	2^n
c)	$\sqrt{n}$	$(\log n)^3$
d)	$n2^n$	3^n
e)	$\sum_{i=1}^{n} i^k$	n^{k+1}
f)	2^n	2^{n+1}
g)	$n^{1/2}$	$5^{\log_2 n}$
h)	log2n	log3n

3-) List the following functions according to their order of growth and prove your assertions.

Logn, $\sqrt{n+10}$, n + 10, 10^n, 100^n, n^2logn, $32^{\log n}$, n^6

4-) Analyze the complexity in time (big -Oh notation) of the following operations at a given binary search tree (BST) that has height n:

a) FindMin.
b) Searching a node.
c) Delete a leaf node.
d) Merging with another BST that has height n.

5-) Find the time complexity (big -Oh notation) of the following program.

```
void function(int n)
{
   int count = 0;
   for (int i = 2; i <= n; i++)
        if  (i % 2 == 0)
        {
                count++;
        }
        else
        {
                i = (i – 1) * i;
        }
}
```

Notes:

- Your submissions will be handwritten.
- You can deliver your homework to TA M. Burak Koca until 16:45 on due date (room 119).
- Do your homework personally, group studies will be considered as cheating.