GIT Department of Computer Engineering
CSE 222/505 - Spring 2018
Homework 02
Due date: March 19 2018 – 12:00

1. Prove using only the definitions of asymptotic notations. (15p)
   a. $n2^n$ is in O(2^{2n})
   b. n! is in Ω(2^n)
   c. (log n) is in Θ($log_{64} n$)

2. Sort the following functions from slowest to fastest in terms of their growth. Using limit estimation. (10p)

   $(lgn)^{lgn}$, lg(n!) , n , lg(lg(n)) , lg(2^n) , lg(lg($\sqrt{n}$))

3. Solve the following recurrence relation using the substitution method. (15p)

   T(n) = 2T(n-1) + 1 n>1, T(n) = 1 n=1

4. Explain the running time of f(n) using recurrence relation. (10p)

   f(n):
   ```
   if (n == 1)
       return 1
   else
       return f(n-1) + f(n-1)
   ```

5. What does do UnknownFunction? Analyze the running time of UnknownFunction using proper asymptotic notations. (15p)

   UnknownFunction(n):
   ```
   i = 0
   while (n%2 == 0)
       n = n/2
       i++
   return i
   ```

6. Write Insertion sort with pseudocode Explain analyze of your algorithm worst-case, best-case and average-case using proper asymptotic notations. (20p)

7. Calculate the running time of the Test function. Show your calculation in proper asymptotic notations. (20p)

Test(n):

```
for (int i = 1 ; i < 2n ; i+=4i)
        for (int j = n ; j > 0; j--)
                if ( i*j == target)
                        target = checkFunc(n);
                else
                        print();
```

checkFunc(n){

```
foo(n);
if (n == 1)
        return 1;
else
        return checkFunc(n/2);
}
```

foo(n){

```
for  (int i = 0 ; i < n ; ++i)
        print();
}
```

*Assume that arithmetic operations and print() can be done in constant time.

Note:

- Do not email your homework or submit it through moodle.
- Your submissions will be handwritten.
- You should handover the submissions to theTuğbagül Altan Akın before 12:00 on due date.
- Fatma Nur Esirci will score this homework.