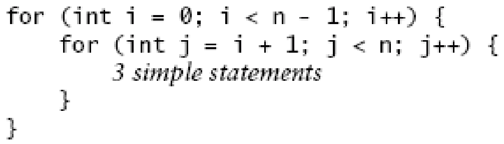
GIT Department of Computer Engineering
CSE 222/505 - Spring 2017
Homework 2
Due date: March 06 2016 – 23:55 PM

Q1:

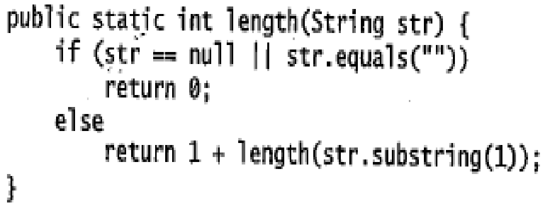
Give running times of each of the algorithms in proper notations. Explain your answers.

1.



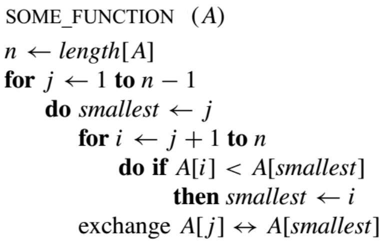
```
for (int i = 0; i < n - 1; i++) {
    for (int j = i + 1; j < n; j++) {
        3 simple statements
    }
}
```

2.



```
public static int length(String str) {
    if (str == null || str.equals(""))
        return 0;
    else
        return 1 + length(str.substring(1));
}
```

Q2:



```
SOME_FUNCTION (A)
n ← length[A]
for j ← 1 to n − 1
    do smallest ← j
        for i ← j + 1 to n
            do if A[i] < A[smallest]
                then smallest ← i
        exchange A[j] ↔ A[smallest]
```

1. What does the function do?
2. Give the best-case and worst-case running times of the algorithm in Ɵ notation. Explain your answer.

Q3:

Prove that the running time of an algorithm is Ɵ(g(n)) if and only if its worst-case running time is O(g(n)) and its best-case running time is Ω(g(n)).

Q4:

1. Express insertion sort as a recursive procedure.

2. Write a recurrence for the worst-case running time of the procedure. Explain your answer.
3. Solve the recurrence. Give detailed answer.

Q5:

Indicate giving detailed explanation whether f(n) = O(g(n)), f(n) = Ω(g(n)) or f(n) = Θ(g(n)) for the following:

1. $f(n) = n^{0.1}$, $g(n) = (\log n)^{10}$
2. $f(n) = n!$, $g(n) = 2^n$
3. $f(n) = (\log n)^{\log n}$, $g(n) = 2^{(\log_2 n)^2}$

Q6:

Rearrange your Homework 1 code using **Array**, **Array List**, and **Linked List** structures. Analyze and compare their performances. Add detailed information about your test and performance analysis method. Also, write detailed analysis results in your report.

RESTRICTIONS:

- Can be only one main class in project
- Don’t use any other third part library

GENERAL RULES:

- For any question firstly use course news forum in moodle, and then the contact TA.
- You can submit assignment one day late and will be evaluated over twenty percent (%20).
- Register github student pack and create private project and upload your projects into github.
- Your appeals are considered over your github project process.

TECHNICAL RULES:

- Use given CSE222-VM to develop and test your homeworks (your code must be working on CSE222-VM), CSE222-VM download link will be given on Moodle.
- Implement clean code standarts in your code;
  - Classes, methods and variables names must be meaningful and related with the functionality.
  - Your functions and classes must be simple, general, reusable and focus on one topic.
  - Use standart java code name conventions.

REPORT RULES:

- Add all javadoc documentations for classes, methods, variables …etc. All explanation must be meaningful and understandable.
- You should submit your homework code, javadoc and report to Moodle in a studentid_hw#.tar.gz file.
- Use the given homework format including selected parts:

-

Detailed system requirements	
The Project usecase diagrams (extra points)	
Class diagrams	
Other diagrams	
Problem solutions approach	x
Test cases	x
Running command and results	x

GRADING :

- No OOP design	: -100
- No interface	: -95
- No method overriding	: -95
- No error handling	: -50
- No inheritance	: -95
- No polymorphism	: -95
- No javadoc documentation	: -50
- No report	: -90
- Disobey restrictions	: -100
- **Cheating**	**: -200**

- Your solution is evaluated over 100 as your performance.
- **Important!** For Q1, Q2, Q3, Q4 and Q5, answers without rational explanations will get 0 points.

CONTACT :

Nur Banu Albayrak