

## CSE201 – Data Structures – Fall 2023

### ASSIGNMENT#1 - (Due date: 14/11/2023 Tuesday, at 23:59)

- This assignment effects overall 15% of your final grade.
- Project groups are allowed. A group can consist of **at most** 2 people.
- The code may be written in C, Java or Python.
- Report submission is mandatory. You must submit a report in addition to project files.

This assignment consists of two part. First part is related to algorithm analysis and recursion. Second part is about the linked lists. The details are as follows:

#### Part 1. Algorithm analysis and recursion

##### a. (20 pts)

If  $T(n) = T(n/3) + \frac{4}{3}n \log_3 n$  and  $T(1)=0$ , then,

Find the final general solution  $T(n)$  in terms of  $n$ . Indicate the solution step by step. You can solve the question on a piece of paper and add a picture of the solution to the report.

Hint: (find  $T(3)$  and  $T(9)$  by yourself)

##### b. (15 pts)

Find **the execution time  $T(n)$**  and **the asymptotic upper bound ( $O(.)$ )** of the code given. Assume that  $n$  is the input size. Indicate each step of the solution. You can solve the question on a piece of paper and add a picture of the solution to the word file.

```
for( int i=1; i<=n; i*=3)
    for (int j=1; j<=n; j++)
        statement;
```

#### Part 2.

In this part of the assignment, you are expected to develop a linked list application (using C programming language, Java programming language or Python) that is used to manage Veterinarian records.

#### Instructions

- ❖ All implementation must be done with a linked list data structure. The sections below will not be graded unless done with a linked list. It is forbidden to use ready list structures that exists in programming languages.
- ❖ Veterinarian (vet) tracking records must have the following properties (10 pts):

**In C Programming Language**

```
int petId;
char petName[20];
char petType[20];
int birthYear;
float weight;
```

or

**In Java:**

```
int petId;
String petName;
String petType;
int birthYear;
double weight;
```

- ❖ Your program must have a main menu including the following commands:
  - Add a new pet record (20 pts) : If user selects this operation, user is prompted to enter *petId*, *petName*, *petType*, *birthYear* and *weight*. The new pet record must be added to the list in numerical order according to the *petId* property.
  - Remove a pet (15 pts) : The user is prompted to enter the id of pet if there is a record with that *petId* property, it is removed from the list.
  - Print all pet records(10 pts): All vet records are listed by all their properties from the first one to the last one at the list.
- ❖ (10 pts for report) You must prepare a report for your projects. A sample report file is attached please fill all necessary parts in the report.

### Submission Details

- ❖ Please send your projects on time. If you submit your project late, you will lose 5 points for each late days. Please keep this in mind and promptly start working on your projects.
- ❖ Project files and the report (docx or pdf) must be compressed as a **single zip** file.
- ❖ Submit the compressed **single zip** file via **aduzem**.
- ❖ Zip file must be named with all group members' student numbers (example→ 2007900011\_2007900012.zip).
- ❖ All group members' names must exist in the report file.
- ❖ One of the group members may submit the assignment.
- ❖ In any forms of copying and cheating all parties will get zero grade from assignment#1.

**Good Luck!**