

Data Structures and Algorithms

Semester 4 / 6 (2020/21)

## SCHOOL OF INFOCOMM TECHNOLOGY

Diploma in Information Technology

Diploma in Cybersecurity and Forensics

**Assignment**

**Duration: 18** January to **7** February 2021 (Week 14 to Week 16)

**Weightage:** 40% of Module

**Individual/Team/Both:** Team of 2 Students (Team with Individual Component)

**Penalty for late submission: 10 marks per day**

**NO late submission shall be entertained after week 17.**

|  |
| --- |
| ***WARNING***  ***If a student is found to have submitted work not done by him/her, he/she will not be awarded any marks for this assignment. Disciplinary action will also be taken.***  ***Similar action will be taken for the student who allows other student(s) to copy his/her work.*** |

There are a total of 6 pages (including this page) in this specification.

1. **OBJECTIVE**

This assignment is to test your understanding of the key concepts in the Data Structures and Algorithms module and to evaluate your ability in the selection, design and implementation of appropriate data structures and algorithms in a C++ application.

1. **INTRODUCTION**

You are to form a team of **TWO (2)** and implement a **C++** application of your choice that applies knowledge of data structures and algorithms learnt in this module.

Your application can be an implementation of a real-life scenario or modification of a classic example. Alternatively, you can implement something novel.

Examples of applications you can implement (not limited to the following):

* Railway/Transport system
* Ancestral records
* Phylogenetic Tree
* Appointment system
* Booking/Ordering system
* Games

The application is required to have at least insert, update, delete and search functionality. A text driven user interface is adequate for the application, however, it should be user friendly.

**Note 1:** You are **NOT** to make use of the Standard Template Libraries (STL) from the C++ standard library for the implementation of your data structures and operations.

1. **BASIC REQUIREMENTS**

The application must:

* Make use of at least one **data structure** per student, together with its processing
* Demonstrate **application of algorithms** learnt (e.g. searching, sorting, recursion etc)

The data structures and algorithms chosen should be appropriate for your application.

The suitability of your chosen data structure and algorithm, the complexity and user friendliness of the application will determine how well you score in this section.

1. **ADDITIONAL FEATURES**

In addition to the basic requirements outlined above, you may implement **additional** features.

Examples of additional features:

* Graphical User Interface
* Advanced data structures (such as composite/ modified data structures, other data structures e.g. doubly linked lists, self-organizing lists, quad trees, ternary trees, graphs etc)
* Algorithm and data structures optimization
* Comparison of different data structures/algorithm and its efficacy

**Only 2 features are necessary for maximum marks (Although you are free to explore and work on more).**

**Marks obtained for the features is still dependent on how well implemented/ comprehensive/complex they are.**

1. **DELIVERABLES**
   1. A **report** in Microsoft word document format that clearly indicates:
2. Team members’ names, student IDs and group name
3. A brief description of the application
4. Roles and contributions of each member in the group
5. **Instructions** on how to run your application
6. Description of data structures and algorithms implemented
7. Detailed explanation of why the data structures and algorithms are selected.
8. All relevant appendices (class diagrams, screenshots, user guides, etc.) wherever appropriate and can help in explanation
9. References for any non-DSA materials used in the report and/or application
   1. Folder containing all the necessary files (solution, .h, .cpp, .dat) to run your application.

**Note 2:** You are required to upload a zipped file to the DSA network folder [\\ictspace.ict.np.edu.sg\dsa](file:///\\ictspace.ict.np.edu.sg\dsa). Leaders are to upload the file to their respective folder. E.g. Name1\_Name2.zip

**Note 3:** A penalty of 10 marks per day after **7 February 2021, 2359** will be applied for late submission.

* 1. A 30-minute presentation that has the following:
* Introduction
* Description of application
* Demo of Application
* Explanation of selection, design and implementation of data structures and algorithms used **(individual presentation)**
* Q&A session

The presentation will be scheduled in the following weeks after submission date. Your tutor will inform you your group’s date and timing.

1. **MARKING SCHEME**

Assignment (**40%** of module):

**Report (20 marks)**

* Clarity and comprehensiveness of the document
* Explain and analyse clearly and comprehensively the selection and implementation of the data structures and algorithms

**Program (60 marks)**

* Basic Requirements (70%)
  + Section 3 of this document
  + Proper documentation and programming style
    - A blocked comment at the top of the class/data structure/algorithm stating Team members’ name, group, student ID and any features that you would like to highlight specifically.
    - A blocked comment at the top of each function, giving brief description of what the function does, including input parameters and return value, if any.
    - Comments at suitable points of the program for clarity.
    - Good programming practices (indentation, good function/variable/attribute naming, reusability, maintainability).
* Additional Features (30%)
  + Section 4 of this document
  + Documentation and programming style

**Note 4:** Unfamiliarity with any part of the program will cause penalties that will compromise the overall assignment grade for a student.

**Presentation (20 marks)**

* Give good introduction of the application.
* Give detailed description of the various functionalities of the application
* Explain clearly and comprehensively the choice of design and implementation of the data structures and algorithms.
* Able to provide good answers in response to tutor’s questions.

**Note 5:** The student must be able to demonstrate understanding of the concepts of data structures and algorithms learnt and their application in the implementation of the application. Unfamiliarity and poor knowledge of work done/related work will cause penalties in program/report, that will compromise the overall assignment grade for a student.

-- End of Document --