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| **TIÊU CHÍ** | **HƯỚNG DẪN** |
| **P1** Create a design specification for data structures explaining the valid operations that can be carried out on the structures. | Use VDM Specification Language to specify Queue data structures including Data type and its operations.  Ref:  1. Book – Data Structures and Algorithms – Chater 2.  2. <https://www.geeksforgeeks.org/abstract-data-types/>  3. <https://medium.com/@lucasmagnum/sidenotes-stack-abstract-data-type-and-data-structure-30e74bb5303a> |
| **P2** Determine the operations of a memory stack and how it is used to implement function calls in a computer. | Present how a memory stack is used to implement function calls in a computer  Ref:  <https://edux.pjwstk.edu.pl/mat/264/lec/main72.html>  <http://www.cs.ru.nl/~erikpoll/hacking/slides/hic3_stack.pdf> |
| **P3** Using an imperative definition, specify the abstract data type for a software stack. | Use VDM Specification Language to specify Stack data structures including Data type and its operations.  Ref:  1. Book – Data Structures and Algorithms – Chater 2.  2.<https://www.geeksforgeeks.org/abstract-data-types/>  3. <https://medium.com/@lucasmagnum/sidenotes-stack-abstract-data-type-and-data-structure-30e74bb5303a> |
| **M1** Illustrate, with an example, a concrete data structure for a First In First out (FIFO) queue. | U  Use Use a real word to explain queue data structure (e.g. Ticket counter line)  <https://www.quora.com/What-are-some-real-world-applications-of-a-queue-data-structure-1> |
| **M2** Compare the performance of two sorting algorithms. | ChooseSelect any two sorting algorithms, analysis, design, implement and compare their performance based on Running time, memory space. (e.g. Selection sort and Insertion sort)  Ref:  1. Book – Data Structures and Algorithms – Chater 1, 8. |
| **M3** Examine the advantages of encapsulation and information hiding when using an ADT. | <http://www.dba-oracle.com/t_object_encapsulation_abstract.htm>  <http://sce2.umkc.edu/BIT/burrise/pl/abstraction-info-hiding-encapsulation/>  <https://www.guru99.com/difference-between-abstraction-and-encapsulation.html> |

Assignment 2

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| **TIÊU CHÍ** | **HƯỚNG DẪN** |
| **P4** Implement a complex ADT and algorithm in an executable programming language to solve a well defined problem. | Use a programming language (C++/Java) to write a program that can send a text messege (maximum 250 characters) from source to destination.  Student should use any data structure(Queue, stack) to act as a buffer during sending messege. |
| **P5** Implement error handling and report test results. | Use Try … Catch to handle exceptions and create a test plan to tets the program. |
| **P6** Discuss how asymptotic analysis can be used to assess the effectiveness of an algorithm | Present how to assess the effectiveness of an algorithm by using asymptotic analysis  Ref:  1. Book – Data Structures and Algorithms – Chater 1, 9.  2.<https://www.tutorialspoint.com/data_structures_algorithms/asymptotic_analysis> |
| **P7** Determine two ways in which the efficiency of an algorithm can be measured, illustrating your answer with an example. | Present two ways in which the efficiency of an algorithm can be measured and use an example to illustrate your answer  Ref:  1. Book – Data Structures and Algorithms – Chater 1, 9.  2.<http://jcsites.juniata.edu/faculty/rhodes/cs2/ch12a.htm> |
| **M4** Demonstrate how the implementation of an ADT/algorithm solves a well-defined problem | E Explain how your program solves sending a text messege from source to destination. |
| **M5** Interpret what a trade-off is when specifying an ADT using an example to support your answer | The algorithm must be efficient in processing the data. The time and space are two major measures to judge the efficiency of an algorithm.Present what Complexity and Time-Space Tradeoff are. Use an example to support your answer Ref:  1. Book – Data Structures and Algorithms – Chater 1, 9.  2. <http://www.papertyari.com/general-awareness/it-knowledge/introduction-data-structures/> |