University of Management and Technology Lahore
School of Science and Technology
Department of Computer Science

Complex Computing Problem (CCP)

Maintaining Business Transactions for an Organization

Semester: Fall 2023

Course: Data Structures and Algorithms (CC2042)

Maximum Marks: 10/100

Shared with Students: Week 7

Submission Date: Monday, Week 13

TABLE I
COURSE LEARNING OUTCOMES (CLOs).

CLO	Description
CLO 1	**Understand** the working of various data structures and their behavior
CLO 2	**Analyze** simple algorithms and determine their complexities.
CLO 3	**Apply** the knowledge of data structures to other application domains.
CLO 4	**Design** new data structures and algorithms to solve problems.

TABLE II
PROGRAM LEARNING OUTCOMES (PLOs) FOR CCP.

PLO	Description
2	**Knowledge for Solving Computing Problems**: Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements
3	**Problem Analysis**: Identify and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.
4	**Design and Development of Solutions:** Design and develop the solutions of the computing problems.
7	**Communication**: Communicate effectively with the computing community about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
9	**Ethics**: Understand and commit to professional ethics, responsibilities, and norms of professional computing practice

TABLE III

Range of Complex Problem Solving

CCP Attribute	Attribute	A Complex Computing Problem
1	Range of conflicting requirements	Involves wide-ranging or conflicting technical, computing, and other issues.
2	Depth of analysis required	Has no obvious solution, and requires conceptual thinking and innovative analysis to formulate suitable abstract models.
3	Depth of knowledge required	A solution requires the use of in-depth computing or domain knowledge and an analytical approach that is based on well-founded principles.
8	Interdependence	Is a high-level problem possibly including many component parts or sub-problems.

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TABLE IV

Blooms Taxonomy Domain Levels

CCP Attribute.	Domain	Description	Bloom's Taxonomy Level
1	Cognitive	**Understanding**: Grasp meaning of materials	C2
2	Cognitive	**Applying**: Use information in a new situation.	C3
3	Cognitive	**Analyzing**: Identify schemas or relationships.	C4
3	Affective	**Valuing:** Attach values and express personal opinion	A3
8	Affective	**Organization or conceptualizing Values:** Reconcile internal conflicts, develop value system	A4

TABLE IV

ASSESSMENT RUBRIC AND DELIVERABLES (MAX. MARKS:15).

Assessment Criteria	CCP Attribute	CLO / PLO	Outstanding	Effective	Inadequate
Problem analysis resulting in constraints to be imposed on solution.	Range of conflicting requirements	4/3	3	2	1
Design including Flow chart / Block diagrams, comparison if alternative solutions.	Depth of knowledge required	5/7	3	2	1
Show interdependence of submodules and their communication	Interdependence	5/7	2	1	1
Report originality		6/9	2	1	0.5
Report flow, and clarity	Depth of knowledge required	6/9	2	1	0.5
Viva.	Depth of know90ledge required, Interdependence	6/7	3	2	1

Complex Computing Problem Statement

Design and implement a project (C++ language) that maintains a collection of business transactions and accounts. The account of a person consists of account id, account title and account balance. The project offers following features:

1. The program offers a text based UI
2. Data is saved into files and also retrieved from file (persistent storage of data is guaranteed)
3. When data is retrieved, it may present itself as a linked list (any subtype will do)
4. When program quits, it saves data into a file before exiting
5. Every node of the list acts as a business transaction
6. A business transaction has two types (i. receivable ii. payable)
7. A transaction can consist of one or more instructions
8. An instruction shows (from, to, amount, description) = (id, id, integer, string)
9. When a transaction is successful, all of its subsequent instructions are executed successfully
10. When a transaction is failed, the data is reverted to its previous state

The solution provided must satisfy the following constraints

Range of conflicting requirements

1. Your project should be able to handle thousands of records
2. The user should not be able to instruct when your project is busy in some processing (discard such commands)
3. The account balance of any user cannot be negative i.e., An instruction that attempts to withdraw an amount that is more than its account balance, fails

Depth of knowledge required

The student should research about the various programming constructs (primitive types, operators, functions, pointers), algorithms, data structures. Students should formulate a suitable abstract model. They should consider factors such as clean programming, better formulation / organization of code structs, and use of suitable and efficient data structures. Students must explore and analyze various techniques to optimize the performance of their code. They should creatively analyze and fine-tune their implementation to ensure efficient resource utilization and minimize idle time.

Report submission tasks: PDF- No other format will be accepted.

1) Report must be written in double column, 10-point font, Times New Romans, with 10 pages providing related references at the end of the report in IEEE format.

2) Report must contain details of implementation and algorithms/techniques used, with proper captions for algorithm, figures and tables, graphs for results. Make your own figures in MS VISIO 2019/ Dia or any other software

4) Use any grammar checking service to improve the grammar of your written report.

The following should be added in the technical report.

1. Title
2. Authors with their affiliation/ Dept/School/University Name/ Email ID.
3. Abstract/ Summary not more than 250 words with Keywords

4. Sequential code Implementation detail
5. References