National University of Computer and Emerging Sciences

Software Re-Engineering (SE4001)

Sessional-I Exam

Date: February 24, 2025

Course Instructor(s)

Dr. Farooq Ahmed

Total Time: **1 hour**
Total Marks: **30**
Total Questions: **3**

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Roll No Section Student Signature

Do not write below this line

Attempt all questions on the answer sheet

CLO 1: Describe Software Re-Engineering principles

Question 1 **[5 marks]**

Describe the concept of Technical Debt in the context of Software Re-Engineering. Give an example of how it may occur?

CLO 2: Explain the activities involved in Software Re-Engineering

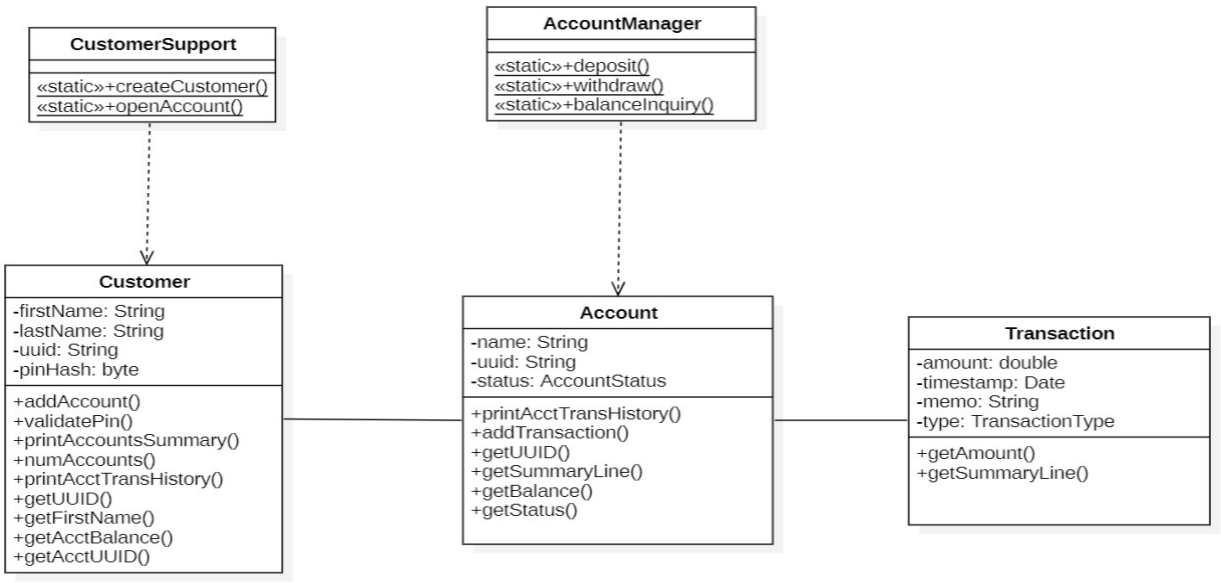
Question 2 **[5 marks]**

List down three steps required for a systematic Reverse Engineering exercise. Which tools can facilitate each step?

CLO 4: Compute metrics to analyze design documents

Question 3 **[10+5+5 marks]**

Consider the design of a simple Digital Wallet application:



Customer class maintains the information of wallet holder and **Account** class tracks details of his account linked to wallet. Record of transactions (debit or credit) in the account is maintained through **Transaction** class where **TransactionType** and **AccountStatus** are enumerations. If the account is active, **AccountManager** can make a deposit or withdrawal. If the account is suspended (temporarily) or closed (permanently) only a balance inquiry can be made. **CustomerSupport** class can be used to create customers and their accounts.

Considering that Account and Transaction classes use the following set of attributes in each of their methods:

Account	Transaction
printAcctTransactionHistory:{ transactions, uuid} **addTransaction:** { transactions } **getUUID:** { uuid } **getSummaryLine:** { uuid, name } **getBalance:** { transactions } **getStatus:** { status }	**getAmount:** { amount } **getSummaryLine:** { amount, timestamp, memo }

Also, given that LCOM (HS) is computed using the following formula:

$$LCOM^* = \frac{\left(\frac{1}{a}\sum_{j=1}^{a} m(A_j)\right) - m}{1 - m}$$

Answer the following:

1. Compute LCOM (HS) for both **Account** and **Transaction** classes and show complete working.

2. Identify the design defects / antipatterns in the given design with proper reasoning

3. Suggest the design patterns to improve the design with proper reasoning