National University of Computer and Emerging Sciences, Lahore Campus

	Course:	**Software Design &Analysis**	**Course Code:**	**CS3004**
	Program:	**BS (CS)**	**Semester:**	**Fall 2022**
	Duration:	**60 Minutes (1 Hour)**	**Total Marks:**	**40**
	Paper Date:	**11-Nov-22**	**Weight**	**15%**
	Section:	**All**	**Page(s):**	**4**
	Exam:	**Sessional II**		

Instruction/Notes: Attempt all questions on the question paper. Neither use nor submit any extra sheet.

Name: _____ Roll Number: _____ Section _____

Question 1 (Max. Marks = 20) [CLO 4]

NUCES library maintains members' accounts and keeps a record of the complete life cycle of every account from its creation until its closure. For a member's account to be created, a member simply has to sign up from the library website. After the account has been created, it must be verified for activation. Verification may include e-mail, phone, and/or address verification. Once an account has been verified, it is considered an active account and a member can borrow books and return borrowed books to the library using this account. If an account is not verified within 24 hours of its creation, it is suspended. Any newly created or active account can be suspended at any time by the administrator. A suspended account cannot be used for borrowing books. However, a suspended account can be used to return borrowed books. An active account may be suspended for security reasons if there are 3 consecutive unsuccessful login attempts using incorrect account password. The administrator, however, will activate this suspended account upon receiving a request from the concerned member. An active account can be closed by the administrator provided there are no outstanding books to be returned and the concerned member has received clearance from NUCES.

Without making any assumptions, use just the information provided above to draw the UML 2 **state diagram** for objects of the Account class.

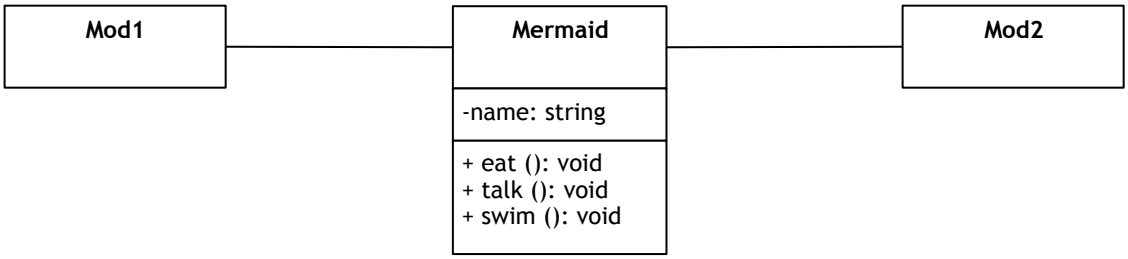
[Use the space below on this page for answering Question 1 only.]

Name: _____ Roll Number: _____

Section _____

Question 2 (Max. Marks = 10 + 10 = 20) [CLO 2]

a) Consider a video game that has different creatures and characters. One interesting creature is a mermaid. The mermaid eats and talks like a woman, and swims like a fish. The Mermaid class provides all of these three functions. This game has several modules. One of these modules (Mod1) uses only eat and talk functions of the Mermaid class while another (Mod2) uses only the swim function.Refactor (improve) the design given below in the light of SOLID principles.

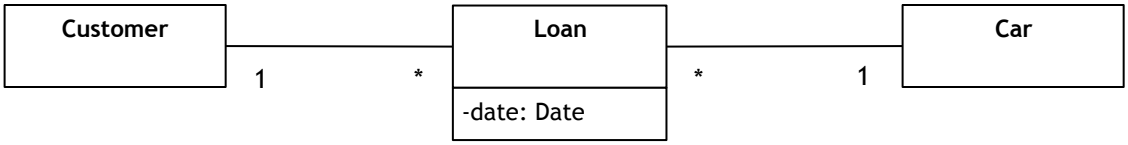


[Use the box below on this page for answering Question 2a only.]

Name: _____ Roll Number: _____

Section _____

b) Consider a company that currently provides only cars on rent/loan to customers. The company may extend its business in the future and introduce other types of vehicles such as vans and buses. Change the design given below to make it more scalable/maintainable in the light of SOLID principles.



[Use the box below on this page for answering Question 2b only.]

Name: _____ Roll Number: _____
Section _____

[Use this page for rough work **only**. Content on this page will **NOT** be graded.]