

CSE-460 (Soft. Anal. & Des.)

Posting ID: 9 8 1 6 3 7 9

Midterm Exam 2: Monday Nov. 07, 2022

Individual Work

Format

- Closed books and notes
- Digital media, internet access, or communication of any kind is **NOT** allowed

- Can have two two-sided, 8.5" × 11" crib sheet
- Crib sheet must be your own & include your Posting ID at top right corners
- The crib sheet must be turned in with the exam

Partial points will **NOT** be given to True/False and Fill-in-the-blank questions

Exam Coverage

All materials (including textbook chapters, course notes, homework assignments, and review sessions) covered in the course prior to this midterm exam

Emphasis will be on the materials covered since Midterm exam 1

Tempe Locations: CDN 60 and CAVC 359

Polytech Location: PRLTA 122

Classroom assignments for Tempe will be announced by 8 AM, Nov. 07, 2022

You MUST HAVE your ASU ID card to take the exam; NO other ID card is acceptable

Please arrive a few minutes early

Read questions carefully and answer what is asked for. Answer all questions.

As necessary, make appropriate assumptions & include them in your answers.

Total points: 100

NOTES:

- All specifications are to be developed according to the UML standards (Astah)
- Use the Java Programming Language as needed

*** Any answer written on the last page will not be graded ***

*** Answers to questions should be written in their provided spaces ***

1. [3 points] For each of the rows in the table below, determine whether the statement is True or False according to the UML class diagram language. Mark your answers with **X**.

	True	False
A class can be an abstract and root	X	
A class can be abstract and leaf		X
A concrete class can be instance scoped		X

2. [8 points] UML classes can have varying levels of abstraction in terms of their attributes. Complete the table below. Mark your answers with **X**.

	Class Attribute		Java programming language	
	Yes	No	Yes	No
Multiplicity		X	X	
Note		X	X	
Type	X		X	
Visibility	X		X	

3. [4 points] The UML sequence and communication diagrams may be used for specifying the behavior of a software system. For each of the Sequence and Communication diagrams, it may or may not allow specifying the features in the table shown below. For each row, write **Yes** or **No** for the Sequence Diagram and Communication diagram columns.

Feature	Sequence Diagram	Communication Diagram
States of objects	Yes	No
Time ordering of interactions	Yes	Yes

4. [6 points] Consider the general categories that all UML diagrams are divided into.

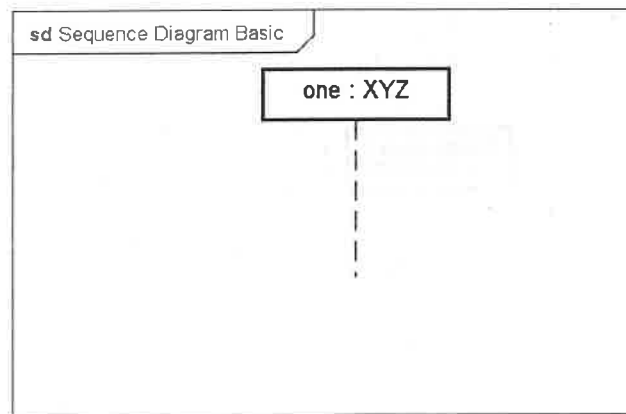
(a) [3 points] Name the category in which the UML object diagram belongs to:

class-based Classifier

(b) [3 points] Identify a UML diagram that is most closely (directly) related to the Object diagram. The identified diagram cannot be in the category the Object diagram belongs to:

Communication Diagram

5. [6 points] Consider the **one:XYZ** element in the partial sequence diagram shown below.



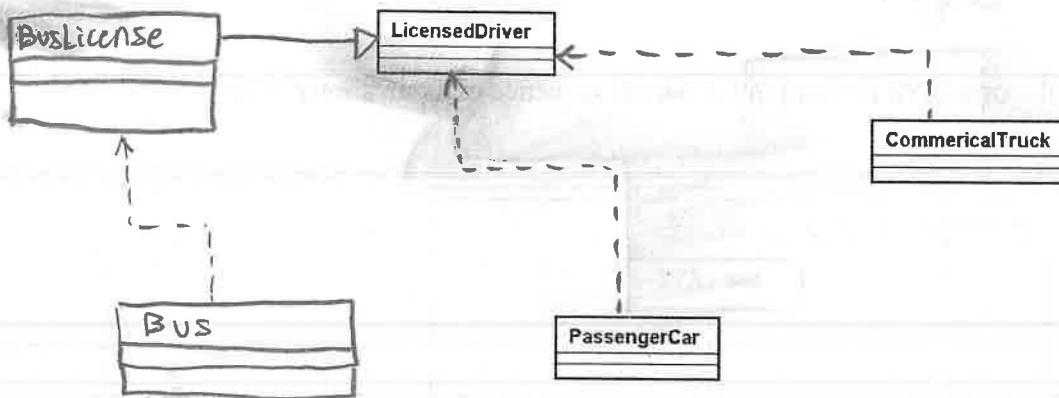
Identify what things the **one** and **XYZ** represent in the above partial sequence diagram.

one: class name

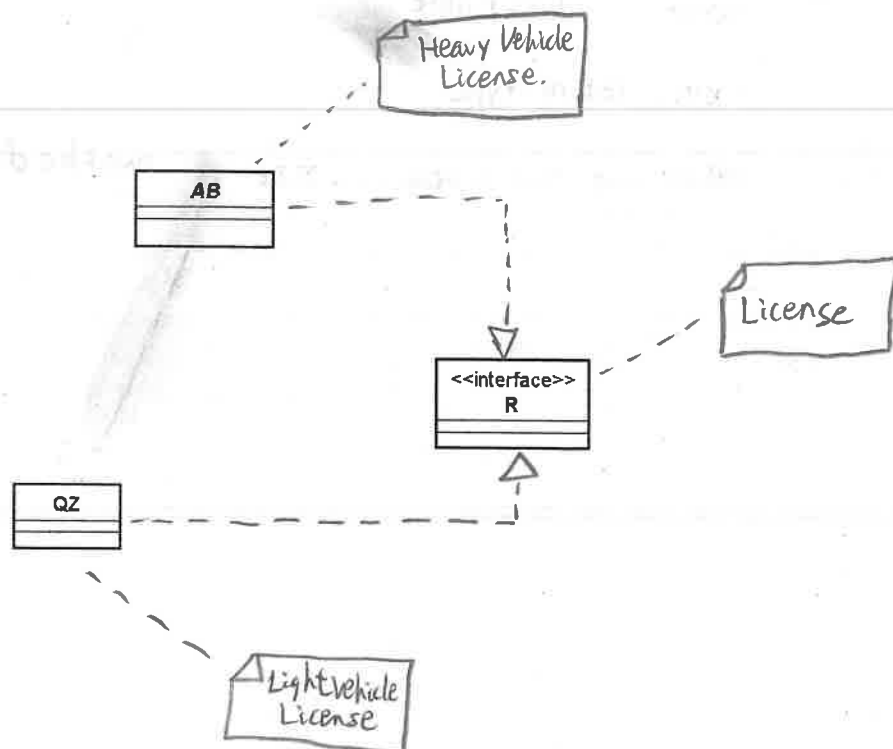
XYZ: return-type

Relationship between **one** and **XYZ**: method

6. [10 points] Suppose different kinds of drivers work at a company. Some employee need driver's licenses to operate passenger cars. Others need driver's licenses to operate commercial trucks. Other kinds of driver's licenses may be required, for example, to operate buses. Complete the class diagram with suitable relationships and constraints. No need to add classifiers.



7. [8 points] Specify a set of relationships among the above classifiers shown in the class diagram below. Hint: details such as attributes and methods are not needed to answer this question.



8. [15 points] Consider a UML class called Seller that has an attribute privilege with possible settings low, medium, and high. There is a method called changePrivilege(...). It can change the privilege, for example, from low to high.

- (a) [3 points] Is there any advantage of specifying public visibility for changePrivilege(...) instead of specifying public visibility for the privilege attribute? Mark your answer with **X**.

Yes X ; No _____ ;

- (b) [3 points] Explain your answer to part (a).

if we specify visibility of public to changePrivilege() method instead of privilege attribute, we can ensure that only changePrivilege() method can be used to alter the privilege attribute. ~~So anytime when something wants to alter~~ on the other hand, if privilege attribute is made public, then anyone can change the privilege which makes it less secure.

- (c) [3 points] Identify all possible source and target states that may be used for specifying a state machine for the seller class.

One source and target state is check ~~the~~ seller and get privilege.
Another source and target state is get privilege and set privilege.

- (d) [6 points] How many transitions are possible for the low, medium, and high states of the seller class? Hint: it is not necessary to specify details for the state transitions.

There are 6 possible transitions low to medium, medium to high, low to high, ~~low to~~ medium to low, high to medium, high to low.
For the ones whose transition brings the privilege from a lower state to a higher state, the seller will ~~be~~ have privilege to sell for example things that a seller of lower privilege state cannot sell. For the ~~the~~ transition from higher privilege to a lower ~~privilege~~ privilege, the seller would for example lose permission to sell certain items that requires a higher privilege.

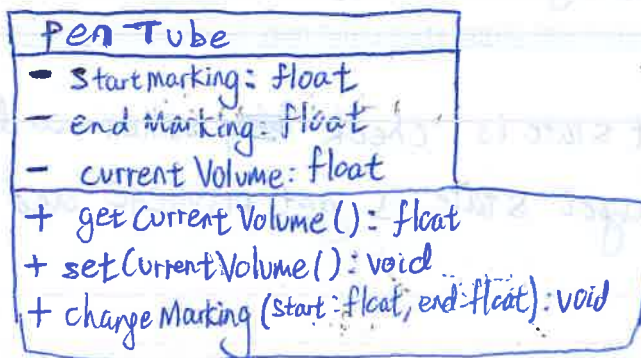
9. [16 points] Consider ink pens that have tubes. A pen's tube has markings ranging from 0.0 (empty) to 10.0 (full) milliliters. The volume can be within any two consecutive markings, for example, 1.3 milliliters.

- (a) [4 points] Identify an approach that is most suitable for classifying the variable for the tube volume. Provide values for the variable.

The approach is classical categorization.

The variable values could be starting from 0.0 milliliters, starting from more than 0.0 milliliters ~~and~~, ~~term~~ ending before 10.0 milliliters and ending on 10.0 milliliters.

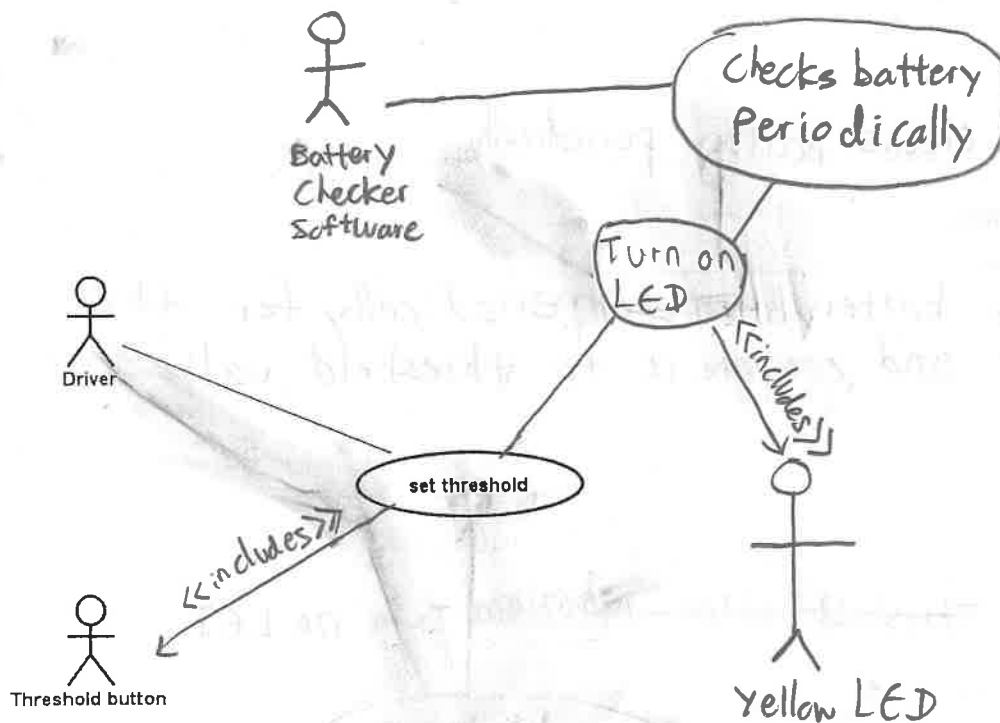
- (b) [12 points] Design a UML class for these pens. This class should specify a pen's tube volume and find its value. The class should have detailed specifications for its attributes and methods. Specification for one of the attributes should have one advanced property in addition to name, visibility, and type.



10. [24 points] A customer is interested in software that informs an Electric Vehicle (EV) driver about the car's battery capacity falling below a threshold. When the battery capacity reaches zero, the car cannot be driven.

- The software periodically measures the capacity of the EV's battery (say every 1 minute).
- The software should notify the driver when its capacity falls below a default threshold. The threshold value is the minimum number of miles the vehicle can travel, given the battery's remaining capacity. The driver can optionally change the battery's capacity threshold.
- The software turns on a yellow LED light when the battery capacity falls below the threshold.
- A driver can change the threshold after a threshold button is activated. When the button is deactivated, the default threshold is restored.

Complete the partial use-case diagram below. Add at least one actor, at least two use-cases, one include relationship, and one extend relationship. Specifications for the relationships should be drawn in the use-case diagram. You may add more actors and use-cases, but do not need to provide descriptions for them. Hint: EV is not an actor.



Provided Actor and Use-case

Driver: A person who can drive an Electric Vehicle.

Threshold button: A button that a driver can activate for changing the battery capacity threshold.

set threshold: Drivers can set the threshold value.

Actor name: Battery checker software.

Actor definition:

It ~~can~~ checks the battery capacity periodically, and if the capacity falls below certain ~~value~~, ~~it can~~ ~~so~~ turn ~~these~~ threshold value, it can turn on the yellow LED.

Use-case name: checks battery periodically

Use-case definition:

checks the battery ~~for~~ ~~are~~ periodically for the capacity and compare it to threshold value.

Use-case name: ~~Threshold button~~ Activation Turn on LED

Use-case definition:

~~once the threshold button is activated by the driver, it alters the threshold value can be changed by the driver.~~

The LED can be lit depending on whether if the ~~threshold value has been~~ battery capacity check by the battery checker software is lower than set threshold.