Midterm Exam 1 Trends

October 04, 2022

Question 1

- What went well?
    - A relatively small number of students were able to identify the correct answer for all 8 blanks.
- Common mistakes:
    - Some students didn't identify "complex" as the right answer for the first blank.
    - Some students didn't identify "few" as the right answer for the second blank.
    - Some students didn't identify "parts" as the right answer for the third blank.
    - Many students didn't identify "restrained" as the right answer for the fourth blank.
    - Some students didn't identify "abstractions" as the right answer for the fifth blank.
    - Few students didn't identify "limitations" as the right answer for the sixth blank.
    - Many students didn't identify "continuous" as the right answer for the seventh blank.
    - Many students didn't identify "discrete" as the right answer for the eight blanks.

Question 2.a & b

- What went well?
    - The modularity principle is needed mainly for the "Structure" of an object's abstraction as the modularity packages abstractions into discrete units, or modules, that make up the structure of a system.
    - Most of the students were able to answer it correctly and provide a valid explanation for this.
- Common mistakes:
    - Few students identified the answer as "Behavioral".
    - Few were able to identify the answer correctly as structural but were not able to explain it properly**.**

Question 3.a

- What went well?
    - **Most** of the students have answered this question correctly.
- Common mistakes:
    - One concept is class
    - Another concept is collection of classes
    - One of the basic and advanced principles of the object model is viewed as the concept for Classes and Objects. Mostly students have provided concepts such as "Modularity", "Encapsulation", "Inheritance", "Persistence", "Concurrency", "Typing" and so on. These basic and advanced principles are a subset of main concepts like classes and objects and thus, received partial credit for this

- Few students have provided the advantages of OOPS languages but not concepts.

Question 3.b

- What went well?
  - Nearly all students have provided the benefits correctly.
- Common mistakes:
  - Few students have provided only one benefit.

Question 4.a

- What went well?
  - More than one-third of the students have identified “entity” abstraction for the first part.
- Common mistakes:
  - Less than half of the students have identified “virtual machine” abstractions for the first part.
  - Some students didn’t explain the identified abstractions well.

Question 4.b

- What went well?
  - Nearly half of the students have identified “action” abstraction for the second part.
- Common Mistakes:
  - Some students have identified different abstractions such as “entity” or “virtual machine” for multiplication operations.
  - Some students have explained the identified abstractions partially correctly.
  - Some students have explained the identified abstractions that were not understandable.

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Question 5

- What went well?
    - About half of the students answered this question correctly that both basic and advanced principles are needed in given scenario
- Common mistakes?
    - Few of the students didn't believe that basic principles are needed.
    - Basic principles are needed as "encapsulation are needed to perform the calculation to hold the logic". Some students were not able to explain why basic principles are needed and thus received partial credit. Concurrency and persistence are required to handle network communication loss. Data Persistence is a means for an application to persist and retrieve information from a non-volatile storage system, thus, will be needed to resume at a point the user lost connection and return the result.
    - Those who have provided explanations with only persistence as an advanced principle have also received full credit.
    - Some students were not able to explain why advanced principles are needed and thus received partial credit.

Question 6.a

- What went well?
    - Majority of the students correctly defined a useful variable for the microphone. Most of them mentioned a variable to store the sound or to check if the mic is on/off.
- Common mistakes?
    - In some cases, students used UML notations in their answers when they were not required to do so.
    - There were a few students who mentioned the microphone's color or circuit board, which were out of scope since the response should be limited to the description given.

Question 6.b

- What went well?
    - Majority of the students correctly defined two useful functions for the microphone. Most of them mentioned a function to convert the sound and to turn the mic on/off.
- Common mistakes?
    - Few students mentioned two different functions for turning on/off the mic, which can be combined into one function since a function was expected to convert sound to electrical signals.

- Few functions such as “converting electric back to sound” was not a valid function since it was deviating from the problem statement (and actual functionality of microphone as well).

Question 6.c & d

- What went well?
  - Most of the students mentioned the microphone as a passive object. The microphone is passive as it responds to the input it receives. The microphone can’t ask for sound to be made by another object.

- Common mistakes?
  - About half of the class answered this incorrectly and have mentioned that the microphone is always listening for the input and it makes it an active object. The microphone converts the sound it receives to an electric signal. It is not acting on anything. See the OOAD textbook, pages 47-49.
  - Few students have identified the microphone as active. They say when a microphone is on, it determines whether the sound is above a minimum threshold before converting it to an electric signal.

Question 7.a & b

- What went well?
  - Most of the students have defined state variables correctly adhering to the problem statement to store the volume of the water tank.
  - Many have provided the values as finite positive values.

- Common mistakes?
  - Half of the class has mentioned units as the type of the variable (e.g., boolean, double).
  - Few were able to identify the units properly for suitable variables such as tank volume (e.g., liters). Half of the students provided units where there is none (e.g., a variable with values true and false for checking if the inflow/outflow pipe is open or closed does not have a unit).

Question 7.c

- What went well?

  - Most of the students have defined a function to check the current volume of water or the state of the inflow/outflow pipe. (Note: such type of behaviors are of type “selector”)

- Common mistakes?

  - A behavior that is resulting in a meaningful change is “selector” type of behavior.
  - Some students have mentioned behavior that is not finding something useful about the water tank such as current water tank level. Few students identified a behavior but, the behavior was not finding something meaningful and thus, have received partial credit.

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Question 7.d

- What went well?

  - Most of the students have defined a behavior to open or close the pipes that is resulting in a meaningful change. (Note: such typed of behaviors are of type “modifier”)
  - Most of the students were able to identify valid pre-condition and post-conditions.

- Common mistakes?

  - A behavior that is resulting in a meaningful change is “modifier” type of behavior.
  - Few students have mentioned behavior that is not resulting in a meaningful change such as calculating the inflow/outflow rate or checking the volume of the water in the tank. Few students identified a behavior but, the behavior was not resulting in a meaningful change and thus, have received partial credit.

Questions 6 and 7:

Note: Those who have used UML notations for questions 6 and 7 (to answer all sub-questions) have lost a point for the entire question as deduction applied in part (a) of both the questions since the question has been asked to answer in terms of the Object Model.

Question 8.a

- What went well?

  - More than half of the students have identified correct attributes and methods for the water tank class.
  - Many have followed correct UML notations and were able to provide the explanation for attributes and operations

- Common mistakes?

  - Few students have not identified an attribute to store the current water volume or the ReleaseVolume.
  - Few students have not identified an operation to update the water level.
  - Few students have not followed UML notations.
  - Explanations for attributes and operations was expected for the WaterTank class and many have just provided the UML class.

Question 8.b

- What went well?

  - More than half of the students have identified correct attributes and methods required for the switch class.

- Common mistakes?

  - Few students have not identified an attribute to store the current state of the switch or the function to operate the switch.
  - Few students have not followed UML notations.

Question 8.c

- What went well?

  - More than half of the class have used either composition or aggregation relationship between the water tank and switch classes.

- Common mistakes?

  - Few students have mentioned dependency relationships.
  - Few students have mentioned inheritance relationships.
  - Few students have mentioned association relationships, which can be considered partially correct since many amongst these did not provide any details for association relationships

Question 9 a

- What went well?

  - Many of the students answered correctly.

Question 9.b & c

- What went well?

  - Few students have defined how the water tank class specification can include its own identity based on its attributes such as a name or an id.
  - Few students have mentioned that every object needs to have a unique identity and there is no need for the water tank class to include its own identity.

- Common mistakes?

  - Some students have mentioned that the water tank should include its own identity so that it can be identified by other classes such as the switch class. But the explanation here is not correct since a class need not hold its own identity to be identified by other classes.