Software design **Name and surname:** _____
Final written exam **Student number:** _____
Date: 26/03/2019 **Time Limit: 1.5 hours**

Rules:

- **DO NOT open the exam booklet until you are told to begin. You should write your full name (no initials, no abbreviations) and student number at the top and read the instructions.**
- You cannot use any source of information for making the exam (e.g., textbooks, slides, class notes and/or any notes and study guides you have created). You can use a calculator, if needed. You cannot use a cell phone or computer.
- This exam is composed of 20 closed-ended questions; for each question there is always one and only one correct answer.
- You will get **1** point for each *correct* answer, **0** points for each wrong or blank answer. Your final grade for this exam is in the usual [0, 10] range and it is computed by summing the scores of all the answers and dividing it by 2.
- You can use any empty sheet of paper for taking notes or for trying things out. Only the work on the exam paper will be graded. You can take notes on the exam paper and mark the correct answers.
- In the last page of the exam paper you will find a large table with all the questions. There, you have to write down your answer for each question in the A,B,C,D form (e.g., if the correct answer of the first question is the second one, then you have to put a B in the first row of the table). **Do not forget to fill the final table, it will be the only part of your exam paper which will be considered when grading it!**
- When you have completed your exam, hand it to anyone in charge of handing it and go have a great evening!

Q1. (1 point) If you need to model the communication patterns among the main entities of your system, which diagram do you use?

A. Sequence diagram

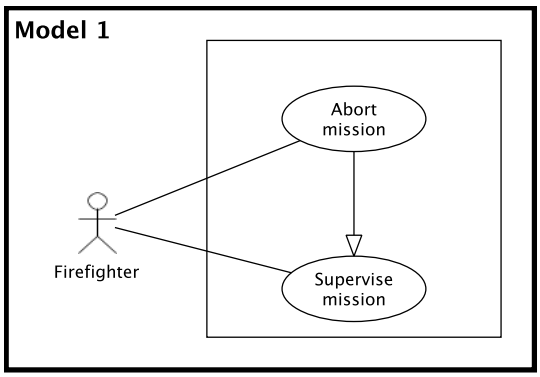
B. State machine diagram

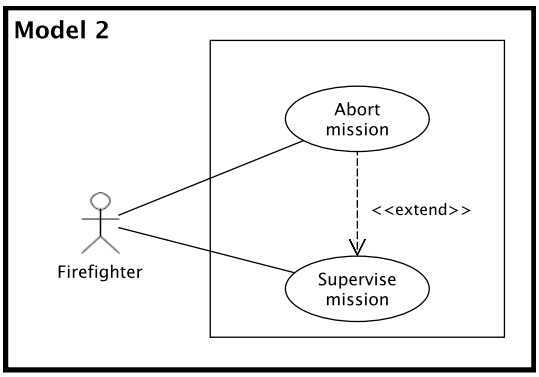
C. Object diagram

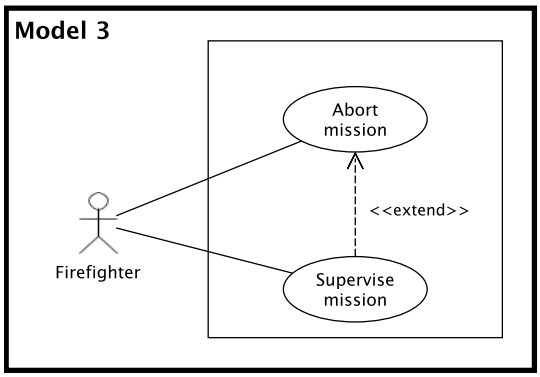
D. Class diagram

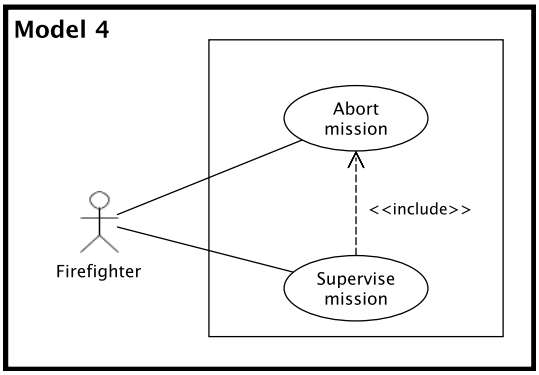
Q2. (1 point) How do you model the following situation with a UML use case diagram?

A firefighter supervises the robotic mission. In the course of the mission, the firefighter might need to abort the mission by pressing an alarm button.









A. Model 1

B. Model 2

C. Model 3

D. Model 4

Q3. (1 point) What is the main purpose of a use case diagram?

A. To model the underlying processes of your system.

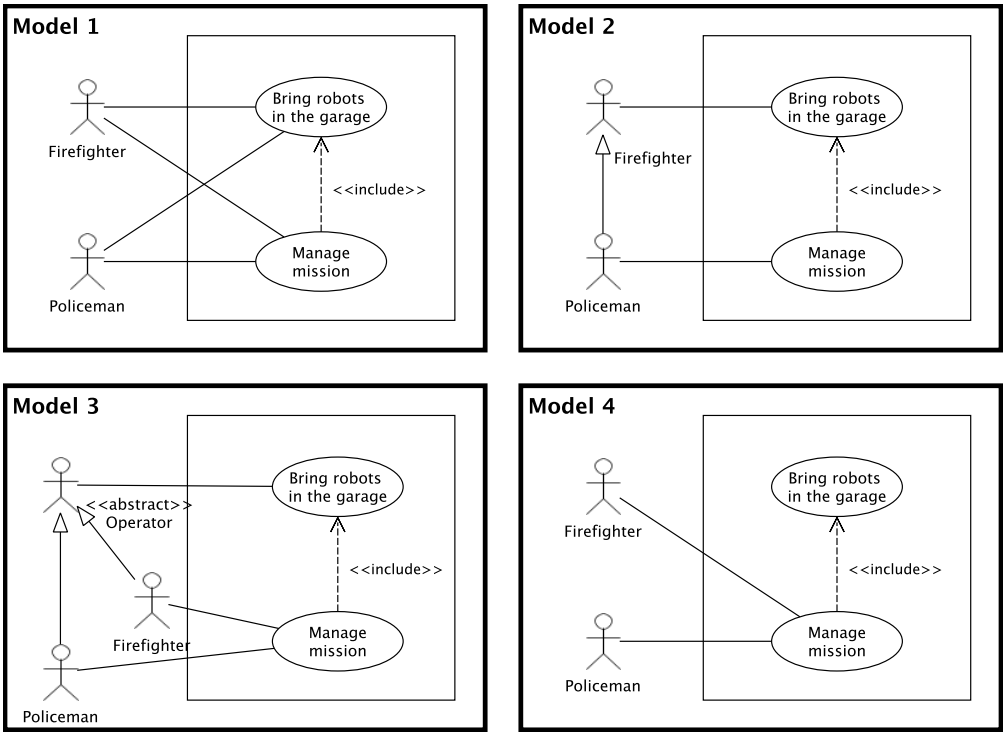
B. To model the main entities of the implementation of your system.

C. To model how the main features of the system are executed at run-time.

D. To model the stakeholders of the system and how they interact with it.

Q4. (1 point) How do you model the following situation with a UML use case diagram?

A firefighter and a policeman must perform a robotic mission together. During the mission, one of them always has to bring the robots back in the garage.



A. Model 1

B. Model 2

C. Model 3

D. Model 4

Q5. (1 point) Which of the following statements about naming variables in your code is TRUE?

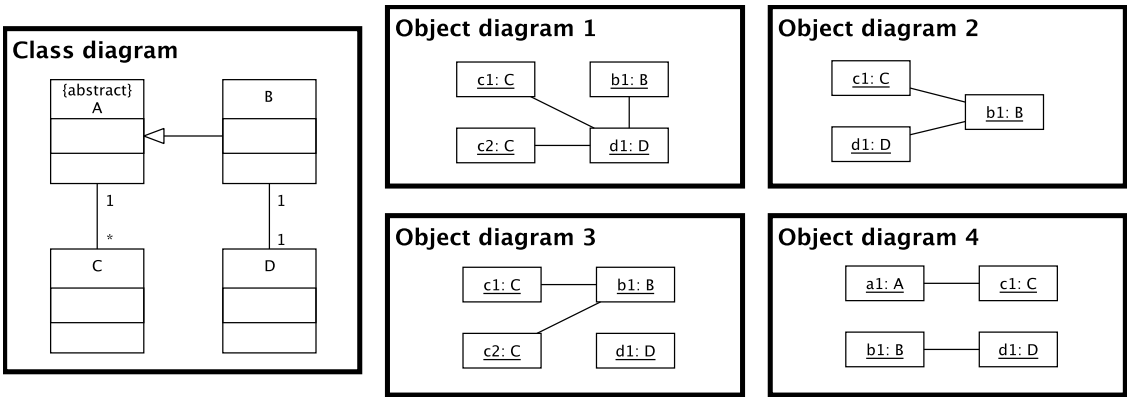
A. Variable names should be as broad as possible.

B. Variable names should convey as much information as possible.

C. Variable names should be as short as possible.

D. When using a temporary variable, a good practice is to always name it *temp*.

Q6. (1 point) Which of the following object diagrams are consistent with the class diagram?



A. Object diagram 1

B. Object diagram 2

C. Object diagram 3

D. Object diagram 4

Q7. (1 point) Which of the following statements about UML associations is FALSE?

A. An association may have navigable, non-navigable, and partially navigable association directions.

B. An association may be identified by a unique association name.

C. An association can have multiplicities and a visibility.

D. An association does not represent the fact that instances of a class are special types of instances of another class.

Q8. (1 point) What is the relationship between a class diagram and an object diagram?

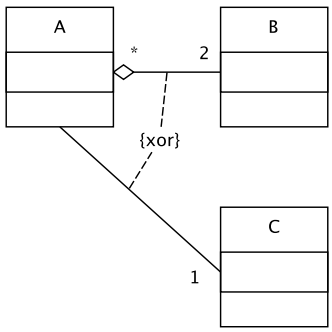
A. An object diagram represents the internal elements of classes that are modelled in the class diagram.

B. An object diagram represents the interaction between classes that are modelled in the class diagram.

C. An object diagram represents the overall behaviour of all the objects conforming to classes that are modelled in the class diagram.

D. An object diagram represents the concrete instances of classes that are modelled in the class diagram.

Q9. (1 point) Given the following fragment of class diagram, which of the following statements is TRUE?



A. One object of A may contain two or more objects of B.

B. One object of B may be associated with multiple objects of A.

C. One object of A is associated with exactly one object of C and two objects of B.

D. If an instance of A is deleted, all contained instances of B are deleted as well.

Q10. (1 point) Which of the following statements about source code comments is TRUE?

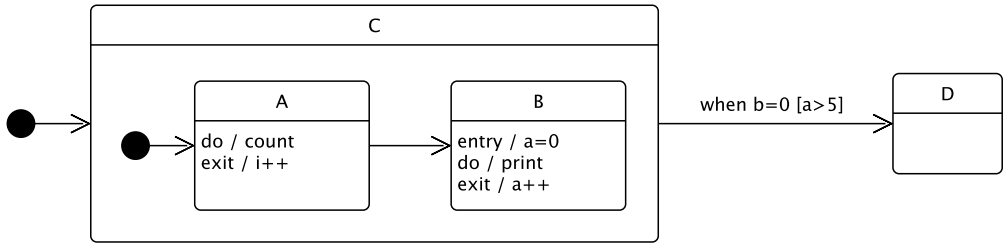
A. Comments contain information which could not be represented in the code.

B. Good code is self-documenting, in principles you do not need comments.

C. It is a good practice to always write comments after you are done with the code.

D. It is a good practice to reiterate what is provided in external documentation as comments in your code.

Q11. (1 point) Given the following state machine diagram, when does a transition to state D occur?



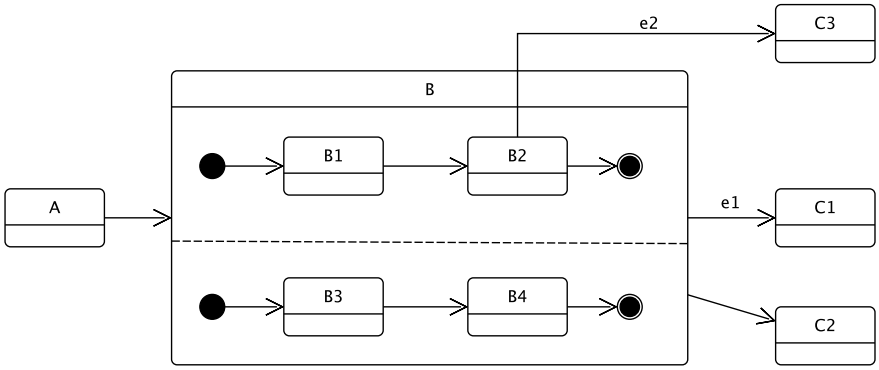
A. As soon as all effects within states A and B are finished.

B. As soon as all effects within state B are finished.

C. As soon as $b = 0$ and a exceeds the value 5.

D. As soon as the event a occurs and the guard is evaluated to true.

Q12. (1 point) Given the following state machine diagram, which of the following statements is TRUE?



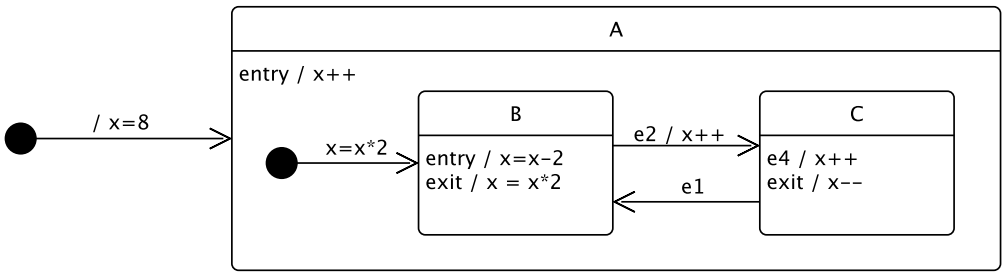
A. C1 is reached when both the two orthogonal regions of B have reached their final states.

B. When event e2 occurs, B is exited independently of the currently active state within B.

C. B is exited when one of the two final states within B is reached.

D. B is exited when event e1 occurs and B1 is active.

Q13. (1 point) Given the following state machine diagram, what is the value of x after the occurrence of the event chain $e2, e4, e4, e1, e2, e2$?



A. 33

B. 65

C. 5

D. 21

Q14. (1 point) Which of the following statements about state machine diagrams is FALSE?

A. Guard conditions are evaluated after executing all the activities of transitions.

B. Transitions can have event triggers, guard conditions, and activities.

C. A transition can have one and only one target state.

D. Activities can be executed during transitions.

Q15. (1 point) Which of the following statements about source code modules is TRUE?

A. When designing modules you should focus on the order in which tasks occur.

B. The users of the APIs of your class should always know all the methods provided by it.

C. Design decisions should be reflected across as many modules as possible.

D. The design decisions guiding the implementation of a module should not be visible to other modules.

Q16. (1 point) Which of the following properties DO NOT apply to the *loop* fragment of a UML sequence diagram?

A. The minimum and maximum number of iterations may be defined.

B. If the minimum and maximum number of iterations are not specified, the default value is $(0, *)$, where $*$ denotes an infinite number of iterations.

C. If you model a loop *loop*(8) with the condition $[x < 8]$, the loop is executed exactly 8 times, independently of the condition.

D. The loop fragment has more than one operand.

Q17. (1 point) Which of the following statements about synchronous and asynchronous communication in UML sequence diagrams is FALSE?

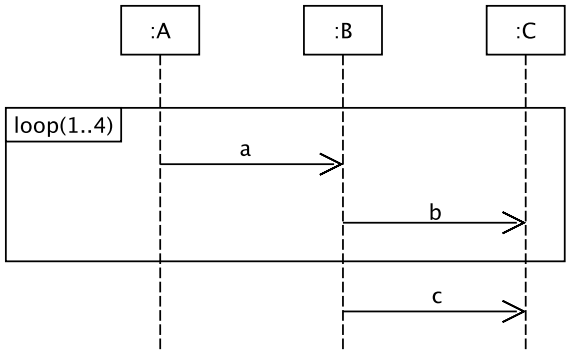
A. With synchronous communication the sender pauses to wait for a response.

B. The sender can send multiple synchronous messages in parallel.

C. With asynchronous communication the sender pauses to wait for a response.

D. The modeling of response messages may be omitted.

Q18. (1 point) Given the following UML sequence diagram, which of the four traces below is NOT possible?



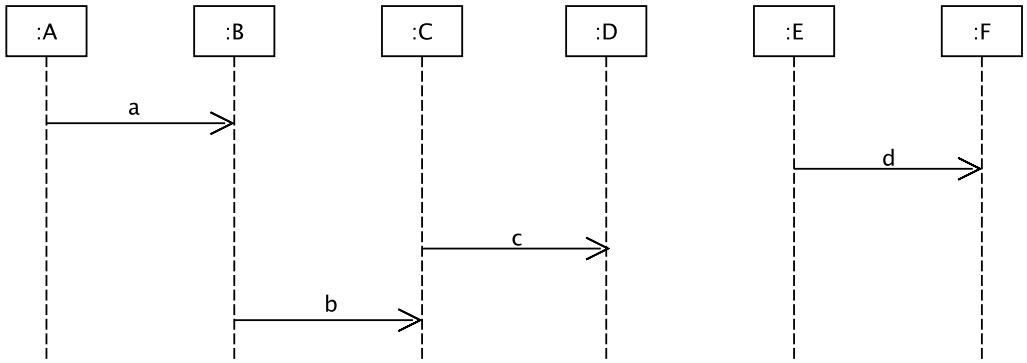
A. $a \to b \to c$

B. $a \to b \to a \to b \to a \to b \to c$

C. $a \to b \to c \to a$

D. $a \to b \to a \to b \to c$

Q19. (1 point) Given the following UML sequence diagram, what is the only possible trace among the four traces below?



A. $a \to b \to c \to d$

B. $d \to a \to b \to c$

C. $c \to d \to a \to b$

D. $c \to b \to a \to d$

Q20. (1 point) Which of the following statements about complexity is TRUE?

A. It is more important for a module to have a simple interface than a simple implementation.

B. It is a good practice to have the same piece of code appearing in many parts of your system.

C. One method should perform as many tasks as possible.

D. It is more important for a module to have a simple implementation than a simple interface.

Question	Points	Answer
Q1	1	
Q2	1	
Q3	1	
Q4	1	
Q5	1	
Q6	1	
Q7	1	
Q8	1	
Q9	1	
Q10	1	
Q11	1	
Q12	1	
Q13	1	
Q14	1	
Q15	1	
Q16	1	
Q17	1	
Q18	1	
Q19	1	
Q20	1	
Total:	20	

Final grade