Number: _____ Name: _____

FCT/UNL Mestrado Integrado em Engenharia Informática

Software Development Methods, 2019/2020

Test A

1st Test 9th of November, 2019

Attention:
This test has a maximum duration of **120 minutes**.

Please do not unstaple this group of pages. This test is composed of multiple **choice questions** parts 0-6 (question 1 to 15) to be answered in the Bubble sheet (given separately) and two open-ended questions (16 and 17) to be answered in the box of page page 9 and 10.

To discourage lottery answering, wrong answers in the multiple choice questions will lead to a discount of ¼ of the grade of the corresponding questions in the final grade. This discouragement is only applied to the first 15 questions.

Each question from 1 to 15 is graded as 0.75 out of 20. The last two open-ended questions are graded in the range of 4 out of 20.

To interpret the questions is also part of the evaluation. Therefore, do not expect help from the professor to interpret them. At the end of the test, you have to give back the test pages and the bubble sheet.

Please ensure that this and the remaining pages are correctly identified. The professors are not held responsible for non-identified pages that are automatically discarded for the evaluation purposes.

When answering in the Bubble sheet, you can use a pencil. This way you can correct it if you make some mistake. Before finishing you have to write with a pen. **Questions 16 and 17 can be answered using pencil.**

Please read carefully before answering. Good Luck!

Part 0 – Motivation – Answer in the bubble sheet!

1. In 1986, Fred Brooks was awarded with the prestigious Turing award for his contribution to Software Engineering. His book "The mythical Man Month" (and the essay introduced in the third commemoration edition of the same book "No Silver Bullet - Essence and Accident in Software Engineering") discusses the reasons for the software development crysis.
   Several techniques ("bullets") are proposed to tackle the problems in software development projects. To explain his view, Fred Brooks decouples two types of complexity. **Identify the <u>correct</u> answer** that properly identify and define those two concepts:
   A. Natural Complexity (born and dies with the problem at stake) and Artificial Complexity (it is introduced by the programmers, and can survive much after the products' life cycle).
   B. Accidental Complexity (problems that can be solved, per example, with optimizations or better development tool selection) and Essential Complexity (unavoidable that must be solved).
   C. Process Complexity (due to the development process itself) and Product Complexity (due to the product).
   D. Simple Complexity (canonical complexity) and Composed Complexity (sums all the existing complexities).

2. Based on the "IEEE Code of Ethics" and other similar documents that bring a reference conduct for engineering professionals, **which of the following sentences is <u>false</u>** regarding their ethics and deontology duties:

   A. to avoid injuring others, their property, reputation, or employment by false or malicious action;
   B. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.
   C. be honest and realistic in stating claims or estimates based on the available data
   D. maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations
   E. Be 100% faithful to the employer, independently of other interests or actors, not taking initiatives that endanger profit, reputation or secrecy

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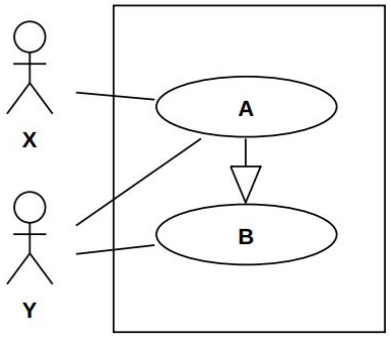
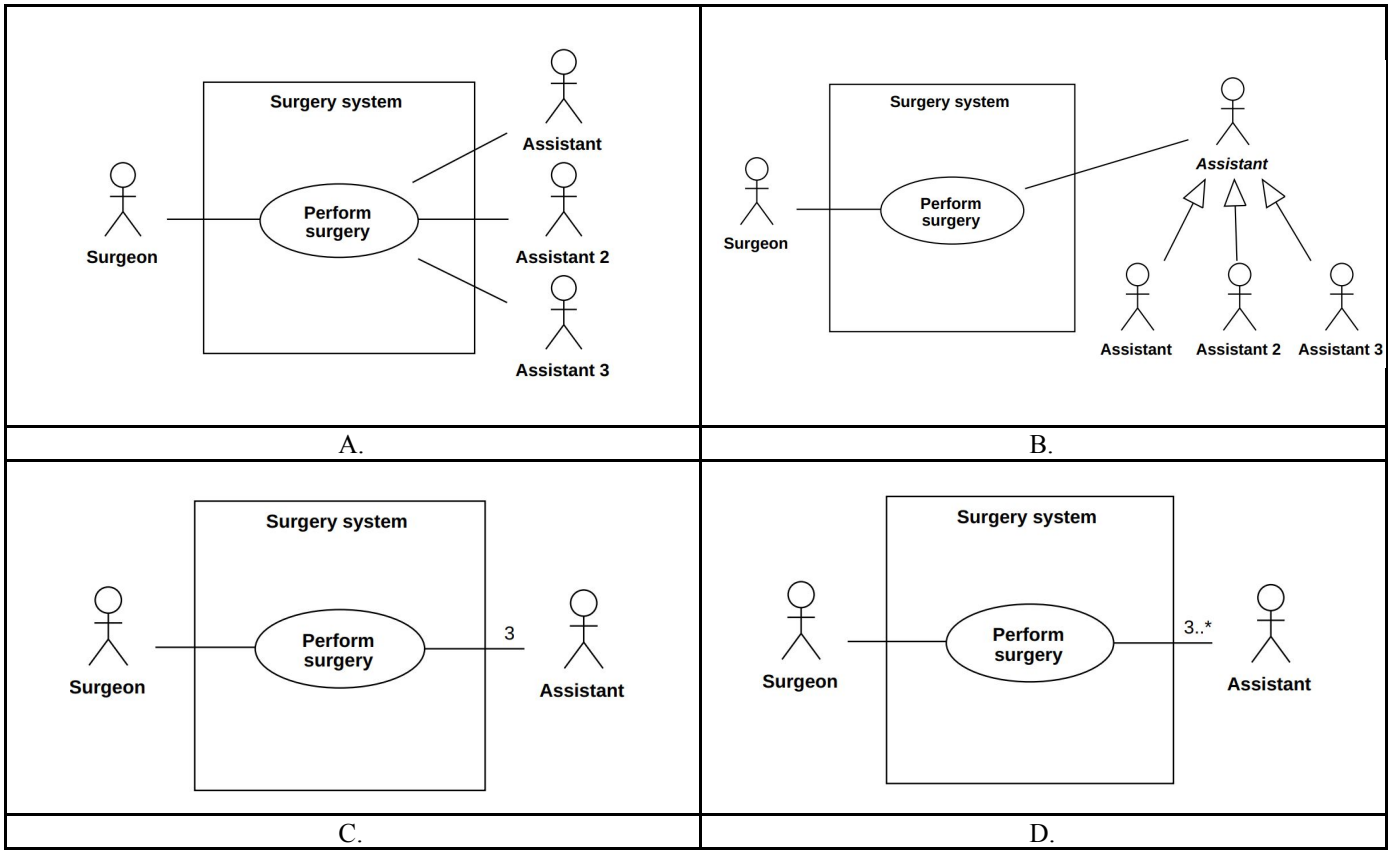
Part 1 – Use Case Diagrams – Answer in the bubble sheet!

3. According to UML 2.0, which combination of actors communicate with use case A?



A. X, Y
B. X, X
C. X, Y, Y
D. X, X, Y

4. How would you model in UML 2.0 the following situation? The surgery is performed by a surgeon and 3 assistants. **Choose the <u>correct answer</u>.**



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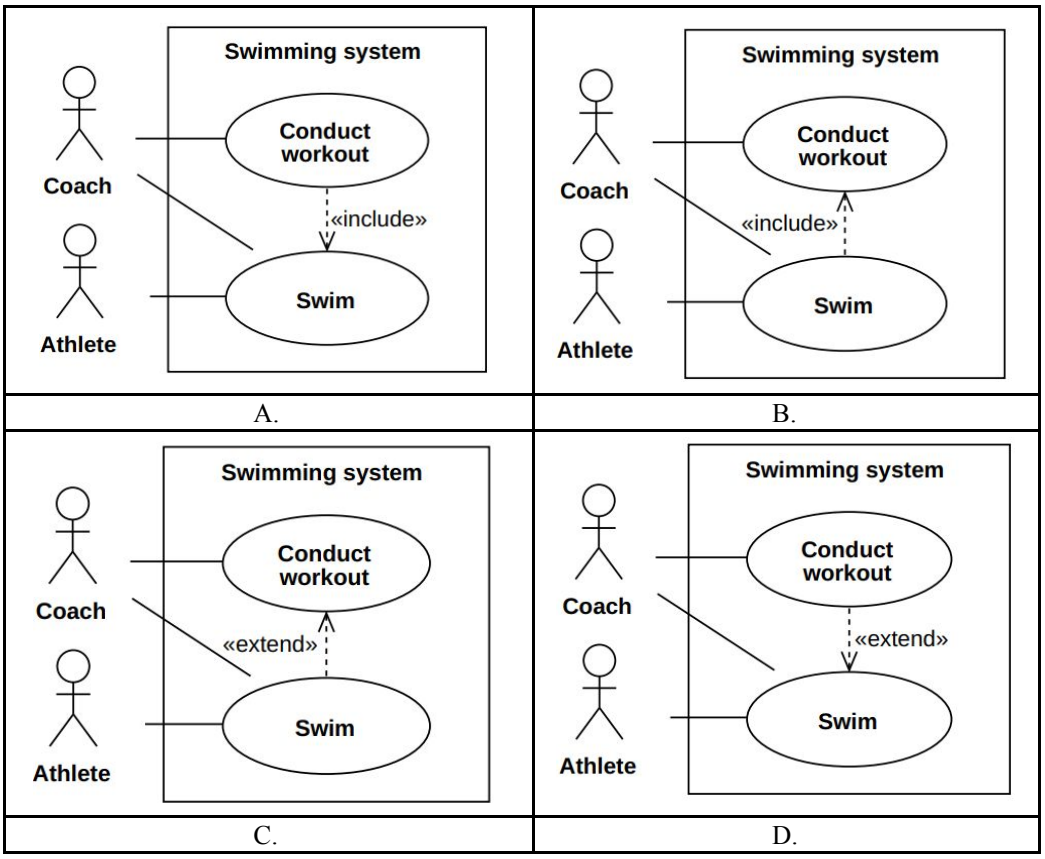
5. How would you model, in UML 2.0, the following situation? During a swimming practice, a coach and an athlete swim. While they are swimming, the coach has to always conduct the workout. **Choose the <u>correct answer</u>.**



Part 2 – Use Case Scenario Description – Answer in the bubble sheet!

6. Consider a booking system for a meeting room. If the primary actor is the client, and the system to consider is the room booking page, which of the following options better represents the main flow of the use case "Book room"? **Choose the <u>correct</u> answer.**

A.
   i. The use case starts when the client selects the option to book a room
   ii. The client selects the date and time for the room booking
   iii. The system verifies the availability of the room
   iv. The system confirms the reservation and the use case ends

B.
   i. Select the option to book a room
   ii. Select the date and time
   iii. Verify availability
   iv. Confirmed reservation

C.
   i. The use case starts when the client wants to book a room
   ii. The client selects, from a calendar, the date and time for the room booking
   iii. The system verifies the availability of the room
   iv. The system confirms the reservation and waits for further instructions

D.
   i. The use case starts when the client selects the option to book a room
   ii. The client selects the data and time for the room booking
   iii. If the date does not exist, the system informs about the error
   iv. The system verifies the availability of the room
   v. If the room is free, then the system confirms the reservation and the use case ends

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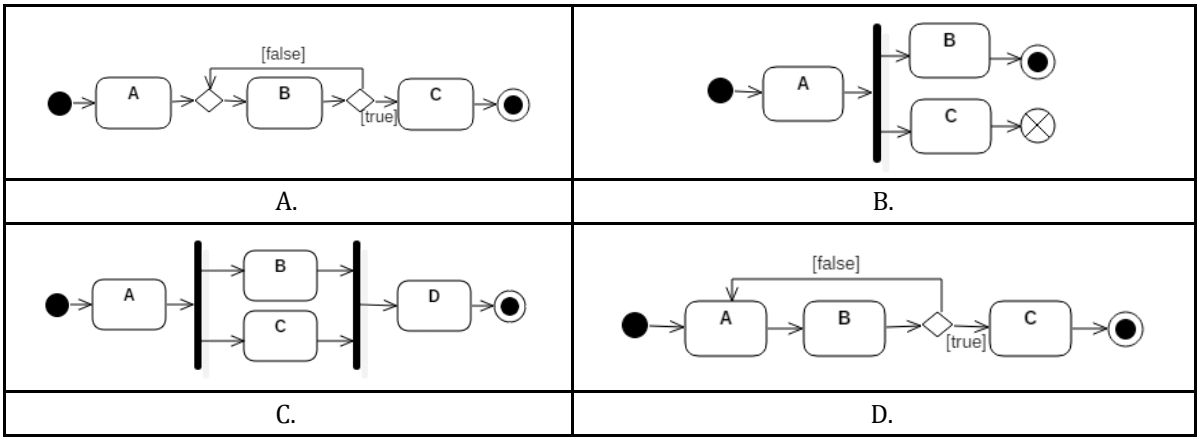
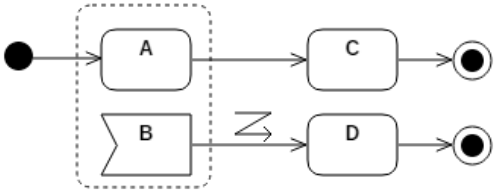
Part 3 – Activity Diagrams – Answer in the bubble sheet!

7. Which of the following diagrams is **incorrect**, considering the control flow?



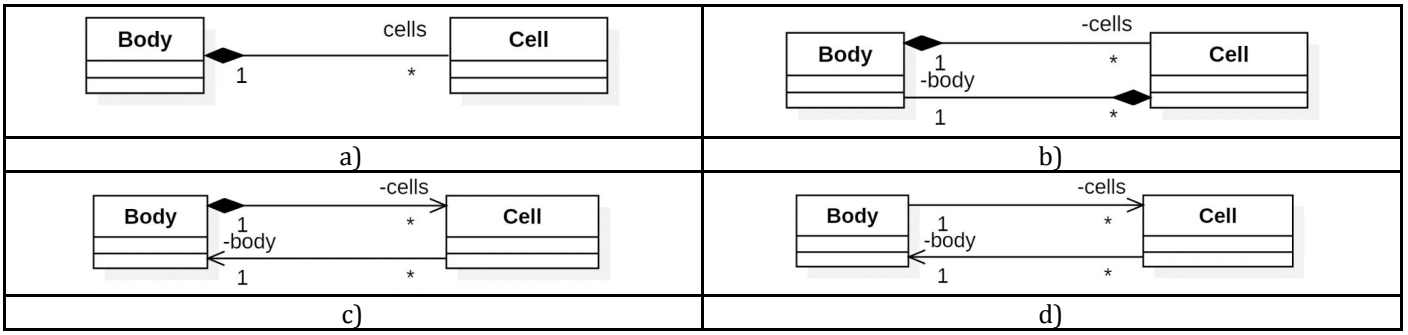
8. Which of the sequences is **possible** during the execution of the following activity diagram?



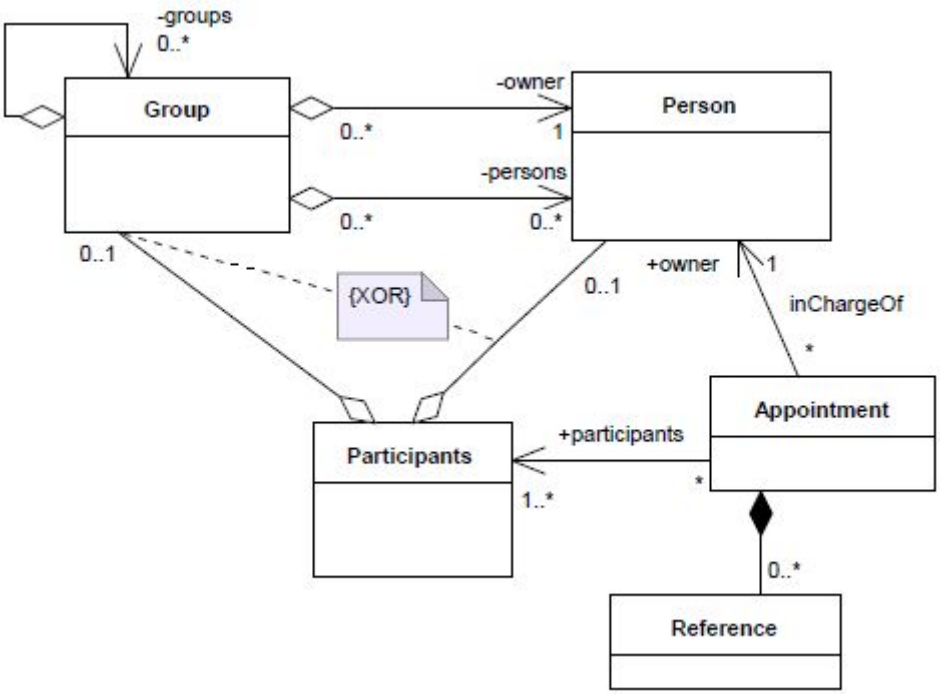
A. A → B → D → C
B. A → B → D
C. A → B → C
D. A → C→ B → D

Part 4 – Class Diagram – Answer in the bubble sheet!

9. How can we refine the following analysis class diagram knowing that: the association is bi-directional; Body is composed by Cells; and, Cells do not exist without a corresponding body. Choose the **correct** answer that is more faithful to the previous statements.



10. Consider the following Class Diagram:



Choose the **correct statement** about the previous diagram:

A. There are groups that are not related to persons.
B. A participant that has been assigned to an appointment can be group and person at the same time.
C. A reference can be assigned to multiple appointments.
D. There are appointments that do not have any participants assigned yet.
E. If an appointment is deleted, all references with which it is related to are reassigned to another appointment.

Part 5 – Package Diagram – Answer in the bubble sheet!

11. Which of the following symbols is used to mark that a certain class is protected? (**Select the correct answer**)
    A. *
    B. +
    C. -
    D. #

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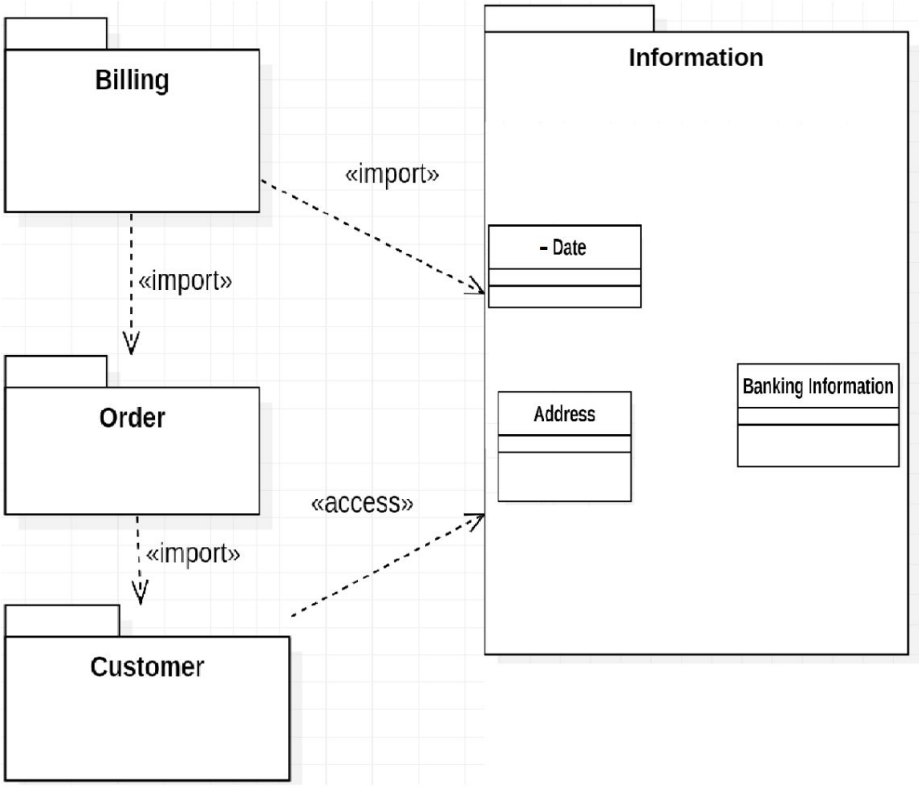
12. Consider the following package diagram:



Considering the previous package diagram which statement is **true**?

A. Date is known by Customer and Order
B. Banking Information is known in Customer and Billing
C. Address is known in Customer and Order
D. All elements of Information are known by Order
E. The private elements of Customer are not known in Billing

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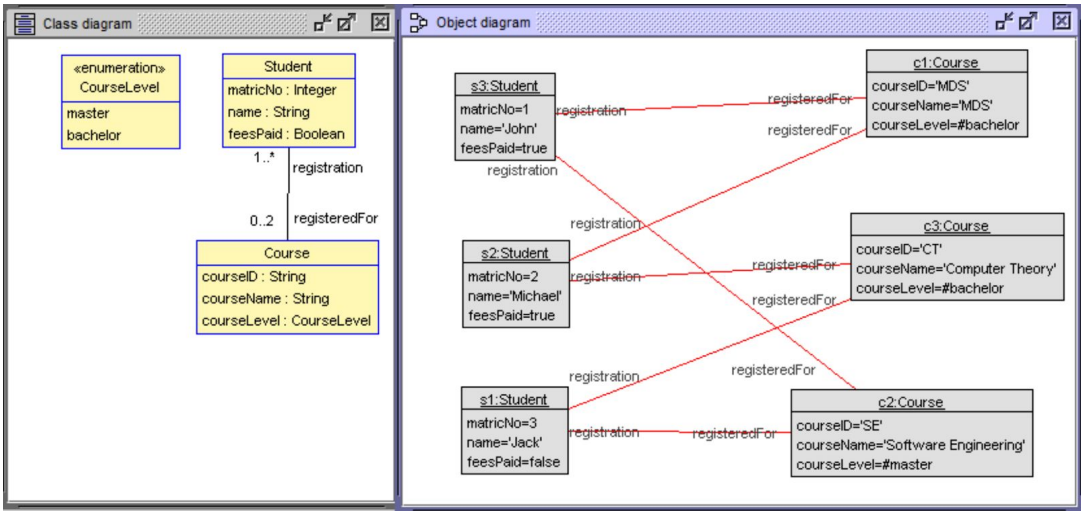
Part 6 – OCL – Answer in the bubble sheet!

13. Consider the following class diagram about the association between course and student and a corresponding object instances model, modelled using the ocl tool USE.



Consider the following OCL invariant constraints:

```
constraints

context Course
inv i1: courseName.size() >= 10 and courseName.size() <= 25

context Student
inv i2: not feesPaid and registeredFor -> isEmpty

context Course
inv i3: courseLevel = CourseLevel::bachelor implies registration -> size() >= 2
```

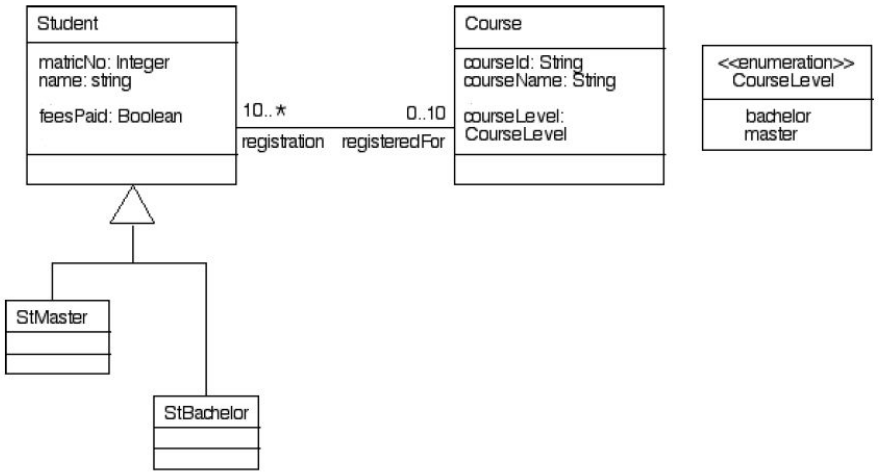
The result of evaluating the three invariant (**Choose the <u>correct</u> answer):**

A. i1, i2 and i3 are false
B. i1 is False, i2 is true, i3 is false
C. i1 is true, i2 is true and i3 is false
D. i1 is false, e2 is false and i3 is true
E. i1, i2 and i3 are true

14. Consider the same class diagrams and instance objects in the relation between student and course in the previous question. Select the statement that is **<u>false</u>:**

A. The result of evaluating
   `Student.allInstances.feesPaid->asSet->size()=2`
   is **`true`**
B. The result of evaluating
   `Student.allInstances->forAll(x,y | x<>y and x.matricNo<>y.matricNo)`
   is **`true`**
C. The result of evaluating
   `Student.allInstances->select( x | x.feesPaid=true implies x.registeredFor->size( )>=2 ).registeredFor.courseLevel`
   is
   `Bag{CourseLevel::bachelor,CourseLevel::bachelor,CourseLevel::bachelor,CourseLevel::bachelor,CourseLevel::master,CourseLevel::master} : Bag(CourseLevel)`
D. The result of evaluating
   `Student.allInstances->union(Student.allInstances.courseID).courseID`
   is **`Bag`**

15. Consider the following class diagram about the relationship between Student and Course.



Select the **correct answer** that best defines the OCL constraint for the rule: a master student can be registered in two bachelor courses.

A.
```
context Student
inv: self.studentCategory = StudentCateg::master implies
registeredFor -> select (courseLevel = CourseLevel::bachelor) -> size() <= 2
```
B.
```
context Student
inv: self.studentCategory = StudentCateg::master and
registeredFor -> select (courseLevel = CourseLevel::bachelor) -> size() <= 2
```
C.
```
context StMaster
inv: self.registeredFor.select (courseLevel = CourseLevel::bachelor). size() <= 2
```
D.
```
context Student
inv: self.oclIsKindOf(StMaster) implies
registeredFor -> select (courseLevel = CourseLevel::bachelor) -> size() <= 2
```
E.
```
context Student
inv: allInstancesOf(Student)->forall (st| st.oclIsTypeOf(StMaster) implies
st.registeredFor -> select (courseLevel = CourseLevel::bachelor) -> size() <= 2)
```

Part 7 – Build your own models! The following questions should be answered inside the white box on the same pages.

16. In developing a system for managing the submission and evaluation of conference papers through a website, you are responsible for describing their workflow through an activity diagram. Access by any system user requires a username and password. For submission, the **author** must register. This done, it is necessary to fill out a form with the name, title, summary, names of the authors. You also need to select the keywords (from a predefined list) related to the article to be submitted. All this information should be verified, and if everything is filled you can upload the article file. At the end of the submission, the **author** receives an email confirmation with the submission number. The **Chairman of the Program Committee (PC chair)** selects papers and assigns them to corresponding **reviewers** (committee members). The **PC Chair** notifies the **reviewers** by email about the corresponding articles that they should review. Evaluators must submit their evaluations by a certain date. Reminders should be sent to the **reviewers** and if an evaluator fails to meet a deadline, they must request a short extension or to be replaced. When the evaluation period is over, the PC ranks articles and determines which ones will be accepted and rejected, and sends the authors an email about the decision. **Identify the appropriate swimlanes and build an activity diagram by modelling the problem described**.

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Build here the activity diagram...

Number: _____ Name: _____

17. Based on the problem description of the previous question, **build an analysis class diagram** that models it properly..

Build here the class diagram...

Number: _____ Name: _____

Auxiliary…

Number: _____ Name: _____

Auxiliary…