

National University of Computer and Emerging  
Sciences Lahore Campus

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## Formal Methods

## Sessional-I Exam

(SE2003) Date: 3<sup>rd</sup> May , 2024

Total Time: 1 Hour

Total Marks: 35

Course Instructor(s)

Total Questions: 3

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	Student Name	Roll No	Section	Student Signature

### Instructions

- All questions should be solved on the question paper.
- Make assumptions where necessary
- In case of multiple solutions, mention the final one
- Use of lead pencil is not allowed.

### Question # 1: Fill in the blanks (8 Points)

1. Opdyke presented preconditions for twenty-three -----refactorings.
2. -----is a constraint that must always be met by all instances of the class.
3. Basic data types used in OCL expressions are -----, -----, ----- and -----.
4. Most navigations/associations on OCL return ----- rather than single elements.
5. The ----- operation results in true if there is at least one element in the collection for which a given expression is true

### Question # 2: Explain (3 points each,9 Points)

1. Optimization versus Refactoring

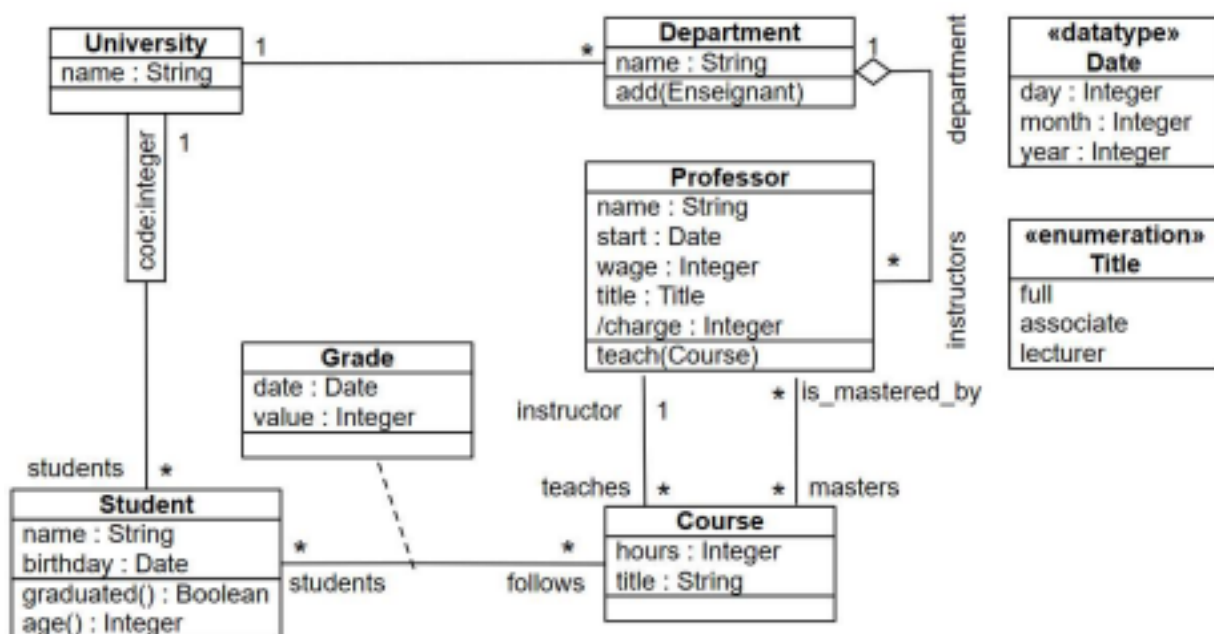
2. Divergent change versus Feature Envy

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## 3. Floss versus Root Canal Refactoring

### Question # 3: (18 Points)

This excerpt contains information about the university, departments, instructors and students.



Write down OCL constraints for the following (3 points each)

1. Define the derived variable charge as the product of wage and the number of courses he teaches using the appropriate syntax.

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2. Write an invariant which ensure that all instructors in computer science department are associate or full professors.
3. The passing grade value is at least 3 for all courses.
4. A graduated student can follow 5 courses.
5. Write the pre-condition for teach method in the professor class. which ensures that he is not teaching 3 courses already.
6. Write the post-condition of add(Enseignant) method in Department class which ensures that after the method is executed the list of instructors includes the newly added instructor.

-----Good Luck-----