

COMP1008
Object-Oriented Programming
2005 Exam
2.5 Hours

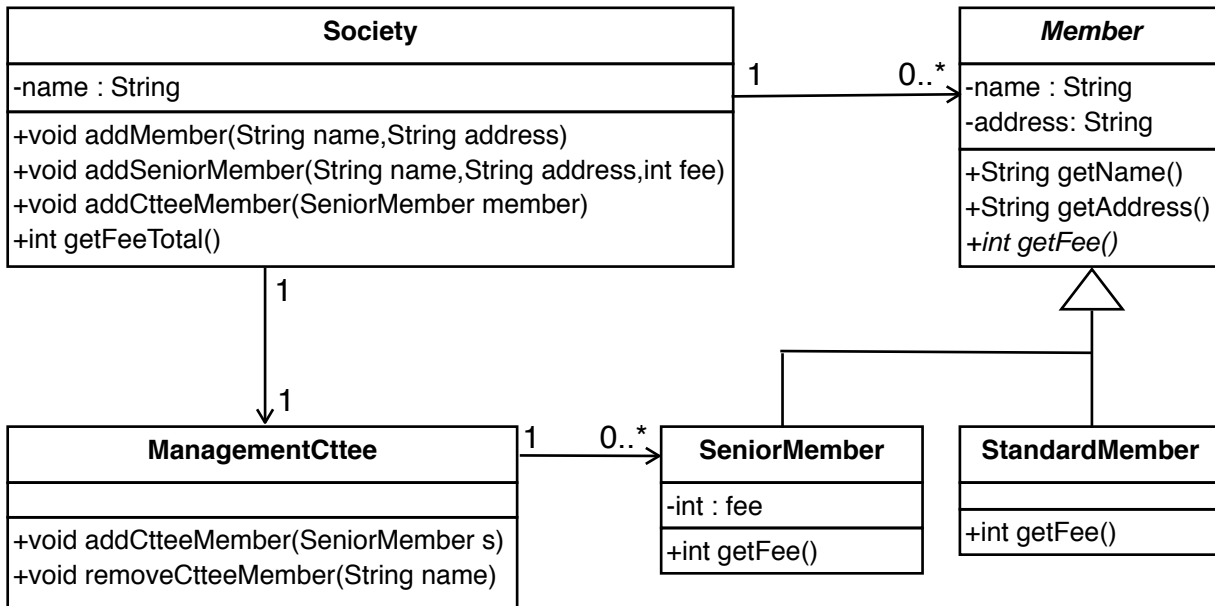
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Answer ALL of Part I and TWO questions from Part II

(Note that in all questions the Java code given in your answers does not have to be syntactically perfect but should, at least, be a good approximation.)

Part I

Q1. Consider this UML class diagram showing part of a program to manage the membership information for a professional society:



a) Write a Java version of class `ManagementCttee` assuming it has this constructor:

```
public ManagementCttee()
```

[7 marks]

b) Class `Member` is an abstract class. Explain the role of an abstract class.

[2 marks]

c) Write a Java version of class `Member` assuming it has this constructor:

```
public Member(String name, String address)
```

and that the method `getFee()` is abstract.

[6 marks]

d) Write a Java version of class `StandardMember` assuming it has this constructor:

```
public StandardMember(String name, String address)
```

and the standard membership fee is fixed at £50.

[4 marks]

(Question 1 cont. over page)

TURN OVER

(Question 1 cont.)

e) Write a Java version of class `SeniorMember` assuming it has this constructor:

```
public SeniorMember(String name, String address, int fee)
```

where the membership fee is set when a `SeniorMember` object is created.

[5 marks]

f) Write a Java version of class `Society` assuming it has this constructor:

```
public Society(String societyName)
```

[8 marks]

g) It should be possible to store the membership information in a data file. Assuming the use of a simple text-based data file:

i) Describe the format of the data file.

ii) Outline each method that needs to be added to each class to write the data file in the correct format. (Java code is not required).

[8 marks]

[Total 40 marks]

End of Part I

CONTINUED

Part II Answer TWO Questions from this Part

Q2. a) Briefly explain each of the following Java terms:

static method, dynamic binding, cast expression, protected, overriding, this

[2 marks each, total of 12]

b) List the keywords associated with exceptions in Java, giving a one sentence description of what each one is for.

[5 marks]

c) Write a class `Stack` in Java. The methods should throw exceptions where appropriate.

[8 marks]

d) Use examples to show how client code should use your `Stack` class from part c) and deal with any exceptions that might occur.

[5 marks]

[Total 30 marks]

Q3. Consider a `LinkedList` class.

a) Write in Java a class `ListElement` to represent the *elements* in a linked list.

[6 marks]

b) Explain the idea of an iterator for a data structure like an `ArrayList` or `LinkedList`.

[4 marks]

c) Write a basic class `LinkedList` in Java using your element class from part a). The class should have public methods to add an element to the front of a list, add an element to the end of the list, and to return an iterator. An iterator implementation should be provided as a nested class.

[12 marks]

d) Write a method to show how an iterator from part c) can be used to print all the items in a list.

[5 marks]

e) A linked list has $O(n)$ performance when accessing a given element in the list using an iterator. Explain what this means and where it is appropriate to use a list rather than another structure.

[3 marks]

[Total 30 marks]

TURN OVER

Q4.

a) The following are examples of good programming practice:

- i. Do not use public instance variables.
- ii. Use appropriate class, method and variable names.
- iii. Properly format source code.
- iv. Always initialise instance variables in a constructor.
- v. A method should be cohesive.

For each example, explain why.

[2 marks each, total of 10 marks]

b) In Java, method parameters are passed by value — explain what this means and give examples of the consequences.

[4 marks]

c) Describe the role of the `final` keyword and give a list of guidelines for when it should and when it should not be used.

[6 marks]

d) Describe how a class can be tested. Illustrate your answer using class `SeniorMember` from Q1, showing how each method is tested.

[10 marks]

[Total 30 marks]

End of Part II

END OF PAPER