Beijing-Dublin International College

School of Computer Science

COMP2011J Object Oriented Programming

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Time Allowed: 90 minutes

Instructions for Candidates:

Answer **All** questions.

BJUT Student ID:———————— **UCD Student ID:**————————

I have read and clearly understand the Examination Rules of both Beijing University of Technology and University College Dublin. I am aware of the Punishment for Violating the Rules of Beijing University of Technology and/or University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I accept the punishment thereof.

Honesty Pledge:———————————————————— **(Signature)**

Instructions for Invigilators

Non-programmable calculators are permitted.

No rough-work paper is to be provided for candidates.

Question 1:

a. Does Java use static or dynamic typing? Does Python use static or dynamic typing? What is the difference between the two? What are the benefits of static typing?

(10 points)

b. Is Java a compiled or interpreted programming language? How does this process work? What are the benefits of this approach? **(10 points)**

c. What is the biggest difference between object-oriented programming and procedural programming? Compare how data is accessed by functions in procedural programs and by methods in object-oriented programs. What effect does this have on the number of parameters required for methods? **(10 points)**

d. What are the main differences between arrays in Java and Lists in Python? How can we find the size of an array in Java (Include an example of finding the size)? Give an example of declaring and constructing an array to remember 10 int values. **(10 points)**

e. Explain the difference between an expression and a statement. Name and explain the use of one of the statements in Java you have learned, give an example showing the statement being used. Can a piece of code be both a statement and an expression? Give an example.

(10 points)

(Question Total 50 points)

Question 2:

a. What is encapsulation? Why is it useful in Object-Oriented Programming? How do we implement encapsulation in Java? **(10 points)**

b. What effect does the keyword `final` have on a variable? Explain the difference between a final primitive variable and a final object variable.

(10 points)

c. Describe how Interfaces can be used to enable code reuse in Java. Describe in detail how an interface would be defined and implemented to make reusable code.   **(10 points)**

d. What is the implicit parameter? Given the following example of comparing two date objects (`birthday` and `today`), which is the implicit parameter?

```
today.sameDate(birthday);
```

Rewrite the following method to show the implicit parameter in the code using the keyword `this`:

```
public void summate(int a){
   count = count + a;
   if (count > 28){
     return sum();
   }
}
```

(10 points)

e. Explain the phrase "prefer composition over inheritance" in your own words. How is this achieved in a Java class? Give one benefit and one drawback of choosing to create a class using composition instead of inheritance.   **(10 points)**

(Question Total 50 points)

Question 3:

a. What is a lambda function? When can we use a lambda function in Java? Define a lambda function to implement the `Calculator` interface defined below. The lambda function should calculate the product of these numbers multiplied by 2 (i.e $a * b * 2$). What parts of the syntax of a lambda function are optional?

```
1  interface Calculator {
2      int performCalculation(int a, int b);
3  }
```

(10 points)

b. What is a callback method? List the steps we must complete to cause a message to be printed on the screen whenever the user clicks the mouse.   **(10 points)**

c. Describe the difference between traditional testing and unit testing. How do we know when we have enough code coverage in our testing?

(10 points)

d. Explain one way that using generics improves type checking in the compiler. Give an example of code that shows a type error being detected when using generics and the same type error not being detected when not using generics.

Explain one way that using generics can simplify the code that we write. Give an example of code that shows code that is simplified using generics and the same code when not using generics.   **(10 points)**

e. What is a Stack Trace? Explain the order that a stack trace is is printed in and why.

(10 points)

(Question Total 50 points)

(Exam Total 150 points)