UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing

B. Sc. Examination 2016

IS51008B/C
Introduction to Programming

Duration: 2 hours 15 minutes

Date and time:

This paper is in three parts: part A, part B and part C, with the following questions

> *There are 3 questions in part A of which you should answer 2.*
>
> *You should answer all of part B.*
>
> *There are 3 questions in part C of which you should answer 2.*

Your answers to part A should be written in separate answer book to the answers to part B and C.

Full marks will be awarded for complete answers to a total of 5 questions, 2 from part A, 1 from part B and 2 from part C. The questions in part A carries 10 marks each. The question in part B carries 8 marks. Each question in part C carries 6 marks. The marks for each part of a question are indicated at the end of the part in [.] brackets.

Each part of the question in part B is multiple choice. You should choose one and only one answer and write down the letter of your chosen answer

There are 40 marks available on this paper.

No calculators should be used.

**THIS PAPER MUST NOT BE REMOVED
FROM THE EXAMINATION ROOM**

Part A
Your project

Answer two questions from this part. These questions all refer to the project you did for this module.

All of these questions will marked based on the quality of the code and coding process *as you describe it*. Marks cannot be awarded unless your description shows clear understanding of the code.

Question 1   Describe one difficult bug you found in your program. Explain how you fixed it.

[10]

Question 2   What were the most important variables in your program. Describe them and how they were used.

[10]

Question 3   Explain the design of one of your classes in your program.

[10]

The mark scheme for all questions in this part is the following:

1-3. a description showing limited understanding of basic code

4. a description of very basic code

5. a description of competent code that uses the techniques taught in class well

6. a description of well designed code that goes slightly beyond what was taught in class

7-8. a description of well designed code that goes considerably beyond what was taught in class

9-10. a description showing deep understanding of code that is beyond the scope of what would usually be expected at undergraduate level

Part B
Multiple choice

answer all question in this part

Question 4   Each question has one correct answer

(a) What is a variable for? [1]

   i. storing data in your program

   ii. gathering several lines for code in a block

   iii. controlling which bits of code run

   iv. adding annotation to your program which you can read but are ignored by Processing

(b) What is a constructor? [1]

   i. functions like *setup* and *draw* that are called by Processing

   ii. a function that is called when creating a object of a class

   iii. the first part of a for loop where you typically put `int i = 0`

   iv. the software that converts your program to machine code and runs it

(c) In this code, what is `mystery`? [1]

```
if(mystery < 4)
{
    point(100, 100);
}
```

   i. a condition

   ii. a function

   iii. a class

   iv. a variable

(d) In if statement, which code is run if the condition is true?   [1]

```
if(a)
{
    b
} else {
    c
}
```

  i. a

 ii. b

iii. c

iv. none of the above

(e) Which of the following draws 10 circles?   [1]

  i. `for(int i = 10; i < 200; i+= 20){`
     `ellipse(i, 50, 10, 10);`
     `}`

 ii. `for(int i = 10; i < 200; i+= 20){`
     `ellipse(50, 50, i, 10);`
     `}`

iii. `for(int i = 10; i < 200; i+= 1){`
     `ellipse(i, 50, 10, 10);`
     `}`

iv. None of the above

(f) What error does this program throw? [1]

```
int [] a;

void setup(){
  a = new int[10];
}

int myFunc(int i){
  if(i >= 0 && i < a.length){
    return a[i];
  }
}

void draw(){
  println(myFunc(mouseX));
}
```

   i. ArrayIndexOutOfBounds

  ii. NullPointerException

 iii. This method must return a value of type int

 iv. unexpected token: void

(g) If a is a correctly initialised array following code throws an error. True or False? [1]

```
for(int i = 1; i <= a.length; i++){
    println(a[i-1]);
}
```

(h) What does this program print? [1]

```
void myFunc(int a){
  a = 3;
}

void setup(){
   int a = 1;
   myFunc(a);
   a += 1;
   println(a);
}

void draw(){

}
```

  i. 1

 ii. 2

iii. 3

iv. 4

Part C

Answer two questions from this part.

Question 5   A student has posted the following request on Goldoverflow, please help them as best you can.

[6]

I'm trying to write a program with a user interface button, but it doesn't work. Help!

```
Button myButton;

void setup(){
    size(640, 480);
    Button myButton = new Button (50, 50, 200, 40);
}

void draw(){
    if(mouseX > myButton.posX && mouseX < myButton.width
        || mouseY > myButton.posY && mouseY < myButton.height)
    {
        myButton.draw();
        myButton.click();
    }
}

class Button
{
  int posX, posY, width, height;

  Button(int x, int y, int w, int h){
    posX = x;
    posY = y;
    width = w;
    height = h;
  }

  void draw(){
    rect(posX, posY, width, height);
  }

  void click(){
    println("I've been clicked"); // temporary test code
  }
}
```

Question 6   Read the following program and answer the questions below.

```
void setup(){
    size(400, 400);
    strokeWeight (1);
}

void draw(){
  background(255);
  for (int x = 0; x < width; x++){
      for (int y = 0; y < height; y++){
          int c = 255-int(255*dist(x, y, mouseX, mouseY)/width);
          if(c < 0)
              c = 0;
          stroke(c);
          point(x, y);
      }
  }

}
```

(a) What does this program do?   [2]

(b) Why does it need 2 for loops?   [1]

(c) Explain in detail what this line of code does   [2]

```
int c = 255-int(255*dist(x, y, mouseX, mouseY)/width);
```

(d) Why is this line needed?   [1]

```
if(c < 0)
   c = 0;
```

Question 7   This question relates to developing a photo browsing app.

(a) You need to develop a class Photo to represent a single photo. What variables should it have? Explain what each one does. [2]

(b) A photo browsing app needs the ability to search for photos based on a number of criteria. Assuming that the photos are represented in array of Photo objects, describe how you would implement searching, giving example code in Processing. [4]