UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing

B. Sc. Examination 2016

IIS50001C
Foundations of Programming

Duration: 2 hours 15 minutes

Date and time:

This paper is in two parts: part A and part B. You should answer ALL questions from part A and TWO questions from part B. Part A carries 40 marks, and each question from part B carries 30 marks. The marks for each part of a question are indicated at the end of the part in [.] brackets.

There are 100 marks available on this paper.

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Part A
Multiple choice

Question 1   Each question has one correct answer

(a) The following statement will run without errors.

```
char x = '2';
int y = 2 + x;
```

   i. True
   ii. False

[4]

(b) What is the final value of the variable **c** after executing the following statement:

```
int  a, b, c;
a=1; b=2; c=3;
a=b;
b=c;
c=a;
```

   i. 1
   ii. 2
   iii. 3
   iv. none of the above

[4]

(c) What is the highest index value associated with the array that follows?

   int[] values = new int[x];

   i. 0
   ii. x-1
   iii. x
   iv. x+1

[4]

(d) What is printed by the following code:

```
int[] a = {0,1,2,3,4,5,6};
print(a.length);
println(a[6]);
```

i. 65

ii. 66

iii. 76

iv. 75

[4]

(e) What is printed by the following code:

```
int k = 0;
int n = 12;
while (k < n)
{
   k = k + 1;
}

println(k);
```

i. 11

ii. 12

iii. 13

iv. none of the above

[4]

(f) Consider the following code fragment:

```
int a = 6;
int b = 12;
while(a<b)
{
   System.out.println("In the loop");
    a+=2;
    b-=2;
}
```

How many times is the phrase "In the loop" printed?

i. 1

ii. 2

iii. 3

iv. 4

[4]

(g) What does the following method do?

```
public int what(int a, int b , int c)
   {
        if (a<b && a<c) return a;
        if (b<a && b<c) return b;
        if (c<a && c<b) return c;
}
```

  i. returns the smallest of the three integers a, b and c

  ii. always returns the value of a

  iii. always returns the value of b

  iv. always returns the value of c

[4]

(h) Consider the following code fragment:

```
public int mystery(int a, int b)
{
    if (b==1)
        return a;
 else
        return a + mystery(a,b-1);
}
```

What is the value of mystery(2,3)?

  i. 2

  ii. 4

  iii. 6

  iv. the program generates a run time error (infinite recursion)

[4]

(i) What key word is used to specify that a data member is a class data member (shared among all instances of that class)?

  i. final

  ii. static

  iii. public

  iv. shared

[4]

(j) Which of these keywords is used to refer to a member of a base class from one of its subclasses?

   i. upper

  ii. super

 iii. this

 iv. None of the mentioned

[4]

Part B

Question 2

(a) i. What is the output of the following program?

```
int x;
void setup(){
  x=10;
  g();
  print(x);
}
void g() {
  int x =5;
}
```

ii. What is the output of the following program?

```
int x, int y;
void setup(){
  x=2;
  y=4;
  h();
  println(x);  print(y);
}
void h(){
  int y =0;
  x =8;
}
```

[8]

(b) What is the output of the following code snipet?

```
for (int i=0; i<6; i++)
{
   for (int j=0; j<i; j++)
   {
     System.out.print("*");
   }
   System.out.println("");
}
```

[6]

(c) Write a method called *reverse* that accepts a String as a parameter and returns a String that contains the characters of the parameter in reverse order.. [8]

(d) Write a method, *isInArray*, that accepts as parameters a list of floating point numbers determines if a particular value is in the list. Your method should return true if the item is found and false othewise. Use the following method header:

```
public static boolean  isInArray(double  []  list,  double  key)
```

[8]

Question 3

(a) i. What is the output of the following program?

```
int [ ] ar = new int [6];
for(int i=0; i<6; i++) ar[i] = i+1;
for(int i = 0; i<6; i++) print(ar[ar.length-1-i]);
```

ii. What is wrong with the following code fragment?

```
int [ ] ar = new int [5];
for(int i=-1; i< 6; i++) ar[i+1] = i;
```

[8]

(b) What are the values in arr after the following statements are executed?

```
int[] arr = {1, 1, 0, 0, 0};
for (int i = 2; i < arr.length; i++)
    arr[i] = arr[i-1] + arr[i-2];
```

[6]

(c) Given the following code fragment:

```
void setup() {
  size(200,200);
}

void draw() {
  background(255);
  stroke(0);
  line(100,0,100,200);
  line(0,100,200,100);
  noStroke();
  fill(0);
  if (mouseX < 100 && mouseY < 100) {
    rect(0,0,100,100);
  } else if (mouseX > 100 && mouseY < 100) {
    rect(100,0,100,100);
  } else if (mouseX < 100 && mouseY > 100) {
    rect(0,100,100,100);
  } else if (mouseX > 100 && mouseY > 100) {
    rect(100,100,100,100);
  }
}
```

Explain what this program does. Your explanation should include a drawing showing the behaviour of the program.

[8]

(d) Write a method called **isSorted** that takes an array of integers as parameter. The method returns true if the array is sorted in increasing order and false othewise.

[8]

Question 4

(a) Explain the difference between between private and public access modifier keywords.   [8]

(b) Consider the following unfinished program:

```
BankAccount b1,b2,b3;


private static  ArrayList<BankAccount> list= new ArrayList<BankAccount>();

   void  setup()
   {
    b1=new BankAccount();
    b2=new BankAccount(2000);
    b3=new BankAccount("Sam", 1500);
    b3.withdraw(2000);
    print1(b1.toString());
    print1(b2.toString());
    print1(b3.toString());
    }

    public static class BankAccount{
    private String name ;
     private double balance;
     private int  accountNumber;
     private static int counter=0;
     public BankAccount(){
           name = "xxxx";
           balance = 0;
           counter++;
           accountNumber=counter;
           list.add(this);

    }
     public BankAccount(double initialBalance) {
       name = "yyyy";
       balance = initialBalance;
       counter++;
       accountNumber=counter;
       list.add(this);
```

```
    }

    public BankAccount(String name, double initialBalance) {
    // finish this code
    }

    public void deposit(double amount) {
     //finish this method
    }
   public void withdraw(double amount) {
     //finish this method
   }
  public double getBalance() {
    //finish this method
  }

  public String toString(){
  return ("Name: " + name+ " Account Number: " + accountNumber +
                                      " Balance: " + balance);
  }
}
```

i. What kind of information do the variables counter and list hold?

ii. Add a two-argument construtor to initialise the name and initial balance. the constructor should have the following signiture:

```
public BankAccount(String name, double initialBalance)
```

iii. Finish the method *deposit(double amount)* that increments the account balance by amount.

iv. Finish the method *getBalance()* that returns the accound balance.

v. Finish the method *withdraw(double amount)* that will withdraw the specified amount if the account has sufficient funds. If there are not sufficient funds, nothing will be withdrawn.

vi. What is the output of this program now?

[12]

(c) Write a method that takes a BankAccount as an argument and removes it from the list of BankAccount (list). This method should have the following signiture:

```
public void removeAccount(BankAccount bacc)
```

[10]