Part A consists of 10 objective questions. Choose the best answer, and write your answer in the answer booklet. Each question carries 1 mark.

1. Object oriented inheritance models the

    A.   "is a kind of" relationship

    B.   "has a" relationship

    C.   "want to be" relationship

    D.   "contains" of relationship

2. What is the output of the following code?

```
public class Test1 {
  public static void main(String[] args) {
    ChildClass c = new ChildClass();
    c.print();
  }
}

class ParentClass {
  int id = 1;
  void print() {
    System.out.println(id);
  }
}

class ChildClass extends ParentClass {
  int id = 2;
}
```

  A. 0   B. 1

  C. 2   D. Nothing

3. Which of the following declares an abstract method in an abstract Java class?

    A.   `public abstract method();`

    B.   `public abstract void method();`

    C.   `public void abstract method();`

    D.   `public abstract void method() {}`

4. Which of the following statements is appropriate to be filled in the blank space in **Program A1** below?

```
//Program A1
public class TestBook1{
   public static void main (String[] args){
   LabBook book = new LabBook ("OOP",75.00);
   }
}
class Book{
   private String title;
   public Book (String t){
   title=t;
   System.out.println("Title : "+title);
   }
}
class LabBook extends Book {
   private double price;
   public LabBook (String t,double p){
   _____
   _____
   System.out.println("Price : RM"+price);
   }
}
```

A. super(t);
   title=t;

B. super(p);
   price=p;

C. super(t);
   price=p;

D. super(p);
   title=t;

5. Consider the following class definition:

```
public class Student
{
    protected int x;
    public abstract double print();
    public void setX(int a)
    {  x = a; }
    public class Student()
    {  x = 0; }
}
```

What is wrong with the class definition?

A.   The keywords public and abstract cannot be used together.

B.   The method **print()** in class **Student** must have a body.

C.   Class **Student** must be defined abstract.

D.   Variable x cannot be declared as protected.

6. Which of the following is a correct definition of interface class `A`?

   A.   `interface A { void print() { }; }`

   B.   `abstract interface A { print(); }`

   C.   `abstract interface A { abstract void print() { };}`

   D.   `interface A { void print();}`

7. Suppose `A` is an interface, `B` is a concrete class that implements `A`. Which of the following is correct?

   i.   `A a = new A();`
   ii.   `A a = new B();`
   iii. `B b = new A();`
   iv.   `B b = new B();`

   A. i and ii only.   B. ii and iv only.

   C. i and iii only.   D. all above.

8. An instance of _____ describes system errors. If this type of error occurs, there is little you can do beyond notifying the user and trying to terminate the program gracefully.

A. RuntimeException   C.   Error

B. Exception   D.   Throwable

9. What will happen when **Program A2** is compiled and run?

```
//Program A2
class Test {
  public static void main(String[] args) {
    try {
      String s = "10.5";
      Integer.parseInt(s);
      int i = 0;
      int y = 2 / i;
      System.out.println("Welcome to Java");
    }
    catch (Exception ex) {
      System.out.println(ex);
    }
  }
}
```

i.   An exception is raised due to `Integer.parseInt(s);`

ii.   An exception is raised due to `2/i;`

iii.   The program has a compilation error.

iv.   The program compiles and runs without exceptions.

A. i and ii only.   B. ii only.

C. iii only.   D. iv only..

10. What is wrong with the following program?

```
//Program A3
class Test {
  public static void main (String[] args) {
    try {
      System.out.println("Welcome to Java");
    }
  }
}
```

A.   You cannot have a try block without a catch block.

B.   You cannot have a try block without a finally block.

C.   A method call that does not declare exceptions cannot be placed inside a try block.

D.   Nothing is wrong.

SECTION B: STRUCTURED QUESTIONS   **(40 MARKS)**

Part B consists of 4 structured questions. Answer all questions in the answer booklet. The marks for each part of the question is as indicated.

Question 1   [10 marks]

Given the following Program B1;

```
1    //Program B1
2    class ClassA{
3       public ClassA(){}
4       public void method1()
5       { System.out.println("UTM"); }
6       public void method1(String a)
7       { System.out.println("UTM" +a); }
8       public void method1(int a)
9       { System.out.println("UTM" +a); }
10   }
11   class ClassB extends ClassA{
12      public ClassB(){}
13      public void method1()
14      { System.out.println("FC UTM"); }
15      public void method1(String a)
16      { System.out.println("FC UTM" +a); }
17      public void method2(String a, int b)
18      { System.out.println("Studied at "+a+" in "+b); }
19   }
20   class ClassC extends ClassB{
21      public ClassC(){}
22      public void method1()
23      { System.out.println("SE@FC UTM"); }
24      public void method1(int a)
25      { System.out.println(" SE@FC UTM" +a); }
26   }
27
28   public class TestFC {
29   public static void main(String []args)
30   {
31   _____
32   _____
33
34   }
   }
```

If the following statements are inserted at line 31 and 32, determine whether the program is correct or has an error during compilation. If the program is correct, state the output. If the program has an error, give the reason. Write your answer as in Table 1.

    a)   ClassA ob = new ClassC();
        ob.method1(2017);

    b)   ClassA ob = new ClassC();
        ob.method1("JB");

```
c)  ClassA ob = new ClassB();
    ob.method2("FC UTM",2017);


d)  ClassC ob = new ClassB();
    ob.method1();


e)  ClassC ob = new ClassC();
    ob.method2("FSKSM UTM",1997);
```

Table 1

Statement No.	Correct / Error	Output/Reason
a)		
b)		
c)		
d)		
e)		

Question 2   [10 marks]

Figure B1 shows relationship of the classes in Program B2. Write the missing Java statements in Program B2 as guided in the comment parts in order to implement the class hierarchy as in Figure B1.

Figure B1
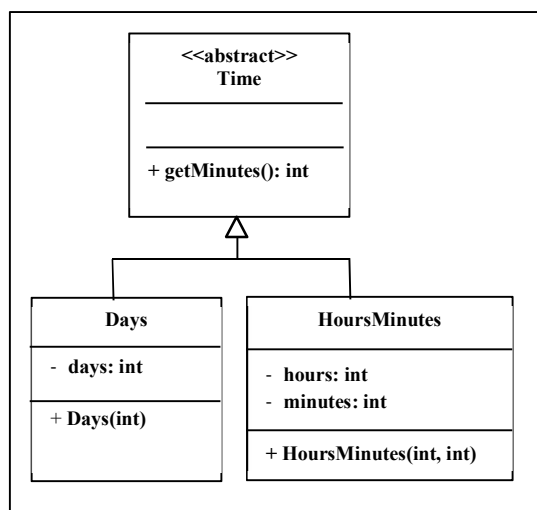
```
1.    // Program B2
2.    _____(i)_____    // Declaration of abstract class Time
3.    {                                                            // [1 marks]
4.    _____(ii)_____    // with an abstract method
5.    }                                         // getMinutes()     [1 marks]
6.
7.    _____(iii)_____    // Signature of class Days that
8.    {                                       // inherits class Time [1 marks]
9.          private int days;
10.         _____(iv)_____    // Parameterized constructor
11.         _____(v)_____    // of class Days [2 marks]
12.
13.
14.         public int getMinutes() {
15.             return days * 24 * 60;
16.         }
17.     }
18.
19.    _____(vi)_____    // Signature of class HoursMinutes that
20.    {                                       // inherits class Time       [1 marks]
21.          private int hours;
22.          private int minutes;
23.
24.          _____(viii)_____    // Parameterized constructor
25.          _____(ix)_____    // of class HoursMinutes [2 marks]
26.          _____(x)_____
27.
28.          public int getMinutes() {
29.              return hours * 60 + minutes;
30.          }
31.      }
32.
33.      public class Demo {
34.          public static void main(String args[]) {
35.    //      Create an object of class Time that refer to class Days
36.    //      named t1 with argument 2
37.          _____(xi)_____              // [1 marks]
38.    //      Create an object of class Time that refer to class HoursMinutes
39.    //      named t2 with arguments 4 and 10
40.          _____(xii)_____       // [1 marks]
41.            System.out.println(t1.getMinutes());
42.            System.out.println(t2.getMinutes());
43.          }
44.      }
45.
```

Question 3 [10 marks]

Given the UML class diagram in Figure B2, Program B3, and output in Figure B3, answer
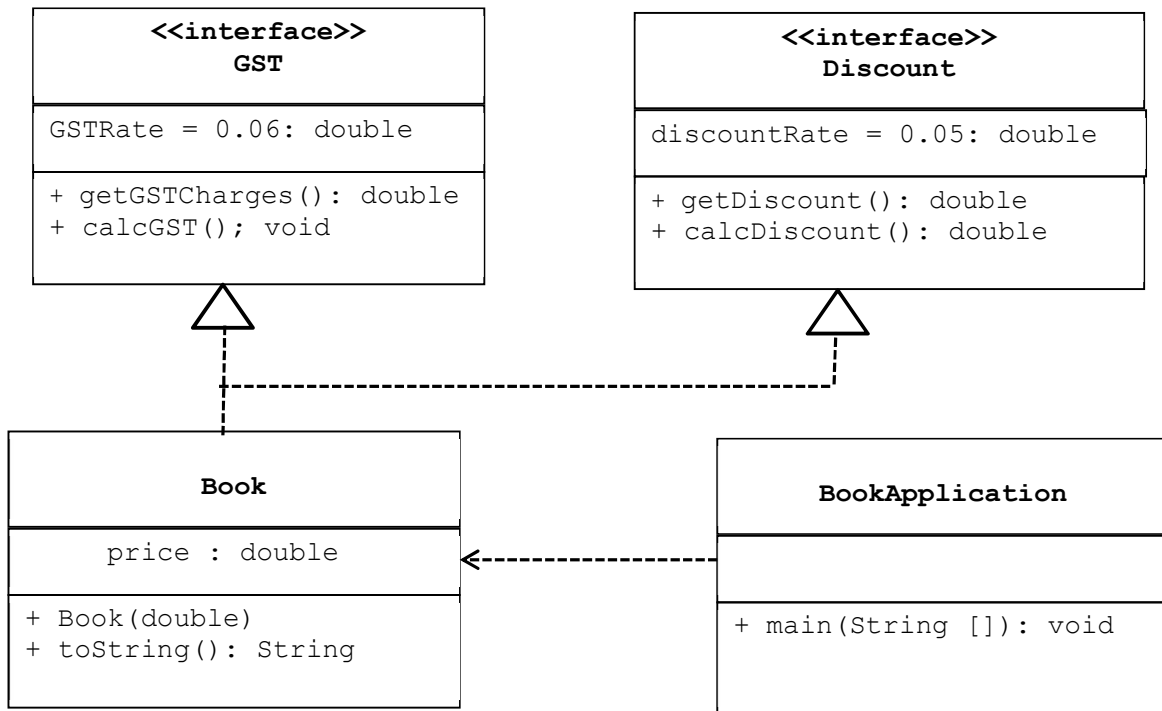the following questions (a) to (c).

<<interface>> GST
GSTRate = 0.06: double
+ getGSTCharges(): double + calcGST(); void

<<interface>> Discount
discountRate = 0.05: double
+ getDiscount(): double + calcDiscount(): double

Book
price : double
+ Book(double) + toString(): String

BookApplication
+ main(String []): void

Figure B2: The UML class diagram

Figure B3 : Output of Program B3

```
1   //Program B3
2
3        _____(a)_____{
4        _____
5        _____
6        _____
7        _____
8   }
9
10
11       _____ {
12       _____
13       _____
14       _____
15       _____
16
17  }
18
19  _____(b)_____{
20  _____
21  _____
22  _____}
23
24       public String toString(){
25            return "\nInitial Price: "+price+"\nPrice after 5%
26  discount: "+ (price-calcDiscount())+ "\nPrice after discount and
27  GST: "+(price-calcDiscount()+getGSTCharges());
28  }
29       public double getGSTCharges() {return price*RATE;}
30       public double calcGST() {return price+getGSTCharges();}
31       public double getDiscount() { return rate;}
32       public double calcDiscount() { return price*getDiscount();}
33  }
34
35  public class BookApplication {
36       public static void main(String[] args) {
37            _____(c)_____
38            _____(d)_____
39
40       }
41  }
```

a) Write Java code that defines GST (line 3-7) and Discount (line 11-15) interface classes [5 marks]

b) Write Java code that defines class Book (line 18-22) that implements the interfaces defined in (a). [3 marks]

c) Write Java code to create a Book object with price is initialized with 10. [1 mark]

d) Display the price of book after discounts and tax levied GST by invoking toString() method. [1 mark]

Question 4   [10 marks]

a. Answer question (i) to (v) as in Program B4 below with suitable codes so that it can
    throw the exception.   [5 marks]

```
//Program B4
  public class FinalExamException {
    public static void main (String args[]) {
      int arr []={30,40};
      Scanner in= new Scanner (System.in);
   ____(i)____  {
    int b = in.nextInt();
    int x = arr[2]/ (b - arr[1]);
   }

   catch (_____(ii)_____ ex) {
   System.out.println("Exceed array size");
   }
   catch (_____(iii)_____ ex) {
   System.out.println("Denominator is zero");
   }

   catch (_____(iv)_____ ex) {
   System.out.println("Invalid data:" +e);
   }

   _____(v)_____  {
   int y = arr[1]/ arr[0];
   System.out.println("y = " +y);
   }
  }
}
```

b. Given Program B5 below, answer the following question.

    i.   Explain why error will occur when Program B5 is compiled?   [2 marks]

   ii.   Rewrite the program so that the program will compile and run properly. [3 marks]

```
//Program B5

class Test {
  public static void main(String[] args) {
    try {
      String s = "5.6";
      Integer.parseInt(s);

      int i = 0;
      int y = 2 / i;
    }
    catch (Exception ex) {
      System.out.println("NumberFormatException");
    }
    catch (RuntimeException ex) {
      System.out.println("RuntimeException");
    }
  }
}
```