

B.Sc. (Honours) Semester-IV Examination 2017
Computer Science
Course : BCSC-41
(Object-Oriented Programming in Java)

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

Answer Question No. **1** and **any three** from the rest

1. Answer all questions.

5×2=10

(a) Given the code. What is the result?

```
public class SomeClass {  
    private Integer value = 1;  
  
    public Integer getValue() {  
        return value;  
    }  
  
    public void changeVal(Integer value){  
        value = new Integer(3);  
    }  
  
    public static void main(String args[]) {  
        Integer a = new Integer(2);  
        SomeClass c = new SomeClass();  
        c.changeVal(a);  
        System.out.print(a);  
    }  
}
```

- A) "1" is printed
- B) "2" is printed
- C) Compilation fails
- D) An exception is thrown at runtime

(b) Given two classes defined in two different files. What is required at line marked "//some code goes here" to process the method doStuff() of a class A?

```
//The first file  
package pack1;  
public class ClassA {  
    public static void doStuff() {  
        System.out.println("doStuff");  
    }  
}  
  
//The second file  
package pack2;  
public class ClassB {  
    public static void main(String args[]) {  
        //some code goes here  
    }  
}  
  
A)ClassA.doStuff();
```

P.T.O.

(2)

- B) pack1.ClassA.doStuff();
- C) doStuff();
- D) It is impossible to use the method doStuff() in the class B.

(c) What is the output for the below code?

```
import java.io.FileNotFoundException;

public class A {
    public void printName() throws FileNotFoundException {
        System.out.println("Value-A");
    }
}

public class B extends A {
    public void printName() throws NullPointerException {
        System.out.println("Name-B");
    }
}

public class Test {
    public static void main (String[] args) throws Exception {
        A a = new B();
        a.printName();
    }
}
```

- A) Value-A
- B) Compilation fails-Exception NullPointerException is not compatible with throws clause in A.printName()
- C) Name-B
- D) Compilation succeed but no output

(d) Which statement is true?

- A) A method with the same signature as a private final method in class Z can be implemented in a subclass of Z.
- B) A final method in class Z can be abstract if and only if Z is abstract.
- C) A private static method can be called only within other static methods in class Z.
- D) A non-static public final method in class Z can be overridden in any subclass of Z.

(e) public class A {

```
    public void test1(){
        System.out.println("test1");
    }
}
```

```
public class B extends A {
    public void test2(){
        System.out.println("test2");
    }
}
```

1. public class Test {
2. public static void main (String[] args) {
3. A a = new A();
4. A b = new B();
5. B b1 = new B();
6. // insert code here

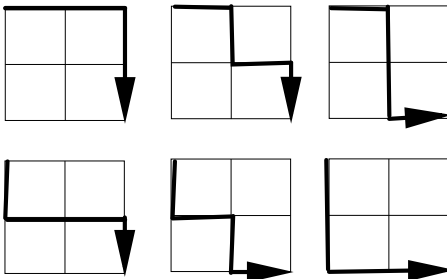
7. }
8} }

Which of the following, inserted at line 6, will compile and print test2?

Options are

- A) ((B)b).test2();
- B) (B) b.test2();
- C) b.test2();
- D)a.test2();

2. Starting in the top left corner of 2×2 grid, and only being able to move to the right and down, there are exactly 6 routes to the bottom right corner.



Write a JAVA Program to find the number of such routes in a 20×20 grid?

10

3. A Harshad or Niven number is a number that is divisible by the sum of its digits. 201 is a Harshad number because it is divisible by 3 (the sum of its digits). When we truncate the last digit from 201, we get 20, which is a Harshad Number. When we truncate the last digit from 20, we get 2, which is also a Harshad number. Let's call a Harshad number that, while recursively truncating the last digit, always results in a harshad number a *right truncatable Harshad number*.

Also:

$\frac{201}{3} = 67$ which is prime. Let's call a Harshad number that, when divided by the sum of its

digits, results in a prime a *strong Harshad number*.

Now take the number 2011 which is prime. When we truncate the last digit from it we get 201, a strong Harshad number that is also right truncatable. Let's call such primes *strong, right truncatable Harshad primes*.

Find the sum of the *strong, right truncatable Harshad primes* less than 10^4 .

Write a Java program to do this.

10

4. Goldbach's other conjecture:

It was proposed by Christian Goldbach that every odd composite number can be written as the sum of a prime and twice a square.

$$\begin{aligned} 9 &= 7 + 2 \times 1^2 \\ 15 &= 7 + 2 \times 2^2 \\ 21 &= 3 + 2 \times 3^2 \\ 25 &= 7 + 2 \times 3^2 \\ 27 &= 19 + 2 \times 2^2 \\ 33 &= 31 + 2 \times 1^2 \end{aligned}$$

(4)

It turns out that the conjecture was false. Write a Java program to find the smallest odd composite number that cannot be written as the sum of a prime and twice a square? 10

5. Discuss the two ways of implementing multi-threading in Java. What is the difference between the Boolean '&' operator and the '&&' operator? How we can use a default constructor of a class even if an explicit constructor is defined? What is the difference between static block and static method? Can a static nested class have access to the enclosing class non-static methods or instance variables? $(1.5+1.5)+2+2+2+1=10$
