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(Knowledge for Development)

KIBABII UNIVERSITY

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**UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
YEAR TWO SEMESTER ONE EXAMINATIONS**

**FOR THE DEGREE OF
BACHELORS OF SCIENCE**

(COMPUTER SCIENCE/ INFORMATION TECHNOLOGY)

COURSE CODE: BIT 211/CSC 210

COURSE TITLE: OBJECT ORIENTED PROGRAMMING II

DATE: 17/06 /2021

TIME: 2 .00 P.M. - 4.00 P.M.

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (COMPULSORY)**[30 MARKS]**

a. Using suitable examples, distinguish between Data abstraction and Data encapsulation.

[3 marks]

b. i. consider class declaration below and identify an **interface**, a **subclass** and the **superclass**.

Can a superclass inherit features of a subclass? Explain

[4 marks]

```
class A extends B implements C
{ ... }
```

ii. Explain two ways a class definition can be made mutable using java signatures. **[2marks]**

c. A class is defined as

```
1 public class Date
2 {
3     private int day;
4     private int month;
5     private int year;
6 }
```

i. Write definition of appropriate set methods such that their calls can be actualized.

[3 marks]

ii. Write a line of code that will pass calls to methods defined in (i) using a single statement.

Pass **dummy** arguments to each method.

[2 marks]

iii. Write definition of a toString() method such that it returns a Date object as String of the current Date in the form **day/month/year**.

[2 marks]

d. Which of the following Java statements set **even** to true if n is **even**, and to false if n is odd? (n is an integer.) Assume $n \geq 0$. Give a brief explanation. **[2 marks]**

```
1 boolean even = (n/2.0 == (double)(n/2));
2 boolean even = (n % 2 == 0);
3 boolean even = (n div 2 == 0);
4 boolean even = (n % 2 == n/2);
```

e. Consider the program; comments indicate where missing needed components of the program are to be placed.

```
1 public class MainClass
2 {
3     //definition of a function that prints out a greeting
4     public static void main(String[] args)
5     {
6         // print the greeting
7         //construct a MyClass object called myObject
```

```

8 // update myObject
9 // print myObject
10 }
11 }
12 public class MyClass
13 {
14 // definition of MyClass constructor
15 public static void greetings()
16 {
17 // definition of greetings
18 }
19 public void update(int num, String title)
20 {
21 // definition of update
22 }
23 public void print()
24 {
25 // definition of print
26 }
27 private int numOfItems;
28 private String reportTitle;
29 }

```

i. Suppose you are writing the definition of MyClass on **line 14** above. Which of the following method signatures will be appropriate? [1 mark]

- | | |
|-------------------------------|---------------------------------|
| A. <i>public MyClass</i> | D. <i>public void MyClass()</i> |
| B. <i>public MyClass()</i> | E. <i>public MyClass(void)</i> |
| C. <i>public void MyClass</i> | |

ii. Suppose you wish to call the method that prints the greeting, on **line 6** above. Which of the following statements will call this method correctly? [Note that myObject is the object in MyClass.] [1 mark]

- | | |
|----------------------------------|--------------------------------------|
| A. <i>MainClass.greetings();</i> | D. <i>void result = greetings();</i> |
| B. <i>myObject.greetings();</i> | E. <i>greetings();</i> |
| C. <i>MyClass.greetings();</i> | |

iii. Suppose you wish to construct a MyClass object called myObject on **line 7**. Which of the following statements will correctly do this? [1 mark]

- | | |
|---|---|
| A. <i>MyClass myObject;</i> | D. <i>MyClass myObject = new (MyClass);</i> |
| B. <i>myObject.MyClass();</i> | E. <i>MyClass myObject = new MyClass();</i> |
| C. <i>MyClass myObject = MyClass();</i> | |

iv. Suppose you wish to call the **update** method on **line 8** above. Which of the following statements will call this method correctly? [1 mark]

- A. `update(myObject(3, "Hi!"));`
- B. `update(3, "Hi!");`
- C. `MyClass.myObject.update(3, "Hi!");`

- D. `myObject.update(3, "Hi!");`
- E. `MyClass.update(3, "Hi!");`

- f. i. Where do we register events: on a JMenu, JMenuItem or both. Explain. [2 marks]
- ii. Explain what the following code extract achieves. [2 marks]

```
JButton ear=new JButton ("Save");
ear.addActionListener(e -> System.Exit(0));
```

g. You are given the following elements in a computer memory

45	56	76	66	87
51	89	65	90	43
37	72	63	43	80

Using a relevant array name, write a java extract that will create these elements and sort them in ascending order row-wise. [Use sort () method sparingly] [3 marks]

QUESTION TWO

[20 MARKS]

- a. i. Explain the relationship between an actionEvent object and an ActionListener interface. [2 marks]
- ii. How can one create a class named Registration that is both a JFrame and ActionListener type? Illustrate with a java code segment. [2 marks]
- a. A student wanted to add a label, a text field, buttons and Panel object on a JFrame. He resorted in using FlowLayout manager in arranging the label, text field and button objects on the Panel then BorderLayout in adding the Panel object on the Center of a JFrame.
 - i. Write a java code that will create and initialize label as "Enter Name: ", text field of size 25 character and button objects as "Save", the Panel object and the JFrame as "Login". [3 marks]
 - ii. Write java code extract that will be used to add the created objects in (i) above on the JFrame object. [3 marks]
- b. Write java code extract to demonstrate the parameters of : [4 marks]
 - i. Message dialog box
 - ii. Input dialog box
- c. The formula for computing the area of a cone is $\pi * r + (r + \sqrt{r^2 + h^2})$ where r is the base radius of the cone, h is the height of the cone and π is a constant (PI) with value

3.1428. Write a program that takes the values of r, h as inputs and value of PI from Math class compute and display the surfaceArea(A) as an output. Use the JOptionPane for both inputs and output routine. [6 marks]

QUESTION THREE

[20 MARKS]

- a. Explain the concept **memory management** and discuss why it is a necessary part of computer programming. [4 marks]
- b. When an exception condition arises, an object representing that exception is created and thrown in the method that caused the error. Discuss briefly how java handles this condition and specify both unchecked and checked exceptions. [4 marks]
- c. Explain the appropriateness of **gc()** and **finalize()** methods as used initialization and clean-up services in java. [4 marks]
- d. A class hierarchy is defined as

```
1 public final class Person {
2 private string name;
3 public final void howToMove( )
4 {
5 System.out.println(" Walking");
6 }
7 class Student extends Person {
8 public void howToMove( ) { System.out.println(" Skiing \n"); }
9 public Student( ) { }
10 }
```

Explain TWO errors in the code above.

[2 marks]

- e. A class is declared as

```
1 public class Employee {
2 private String firstname;
3 private String lastname;
4 private String pfnumber;
5 public final double earning( ) { return 0.0; }
6 public final double getSalary( ) {return 0.0; }
7 }
```

- i. Write definition of Class SalariedEmployee who earns a monthly salary such that it implements the method earning () in Employee. SalariedEmployee earns 85% of their monthly salary and pay 15% as TAX. [3 marks]
- ii. Assuming a salaried employee salary is set to 10000.00, what would be the output of the code below if getSalary() and earning() have identical implementation in SalariedEmployee? Explain your answer. [3 marks]

```

Employee e= new Employee( );
Employee ee= new Employee( );
SalariedEmployee se=new SalariedEmployee( );
e = se;
System.out.println(e.earning( ));
System.out.println(e.getSalary( ));
System.out.println(ee.earning( ));

```

[20 MARKS]

QUESTION FOUR

- a. i. A store owner wants to create a website that displays all items in the store. Each item has a name, a price and is organized by department. It would be in the store owner's best interest to create an interface for what defines an item. This will serve as the blueprints for all items in the store, requiring all items to at least have the defined qualities above. Define a java interface for this scenario. [4 marks]
- ii. The owner adds a new item to his store named cookie: Each costs 100 KES, Cookies can be found in the Bakery department and each cookie is identified by a type. Create a Cookie class that implements the **Item** interface, adding methods or fields that are specific to cookies. [4 marks]
- b. A student is a person who has registration number and a programme of study in addition to Personal attributes. A **Person** has name, gender and date of birth. A person **Name** consists of first name and last name, both as Strings. A **Date** is made up of day, month and year.
- i. Write the definition of the class **Date**. [3 marks]
- ii. Write the definition of the class **Name**. [3 marks]
- iii. Write the definition of the class **Person**. [3 marks]
- iv. Write the definition of the class **Student**. [3 marks]

[20 MARKS]

QUESTION FIVE

- a. Why do we require packages and import statements in java? [2 marks]
- b. Consider the definition of a generic class below:

```

public class Student<T> {
    private T regno;
    public void set(T reg)
    {
        regno = reg;
    }
}

```

```

public T get() {
    return regno;
}
}

```

Write java statements that will be used in the main method to initialize two Generic objects having regno as String and integer arguments respectively. [3 marks]

c. Using a loop of your choice, write a java code segment that draws a triangle shown in Figure 1. [3 marks]

```

0 1 2 3 4 5
  1 2 3 4 5
    2 3 4 5
      3 4 5
        4 5
          5

```

Figure 1: Triangle of Digits

d. A week has got seven days. The days are numbered from 1-7. Each day has a name with day 1 being Sunday and day 7 corresponding to Saturday. The names of the days are stored in a private static array **names** whose structure in memory is shown in Figure 1.

Names →

Sun	Mon	Tue	Wed	Thu	Fri	Sat
-----	-----	-----	-----	-----	-----	-----

Figure 1: Structure of an array in memory

- i. Write a line of code that initializes the array **names** with names shown in Figure 1 such that is accessible to all object of the class **Week**. [2 marks]
- ii. Write a method definition that will initialize a day of the week. Day is initialized to a number between 1 and 7. [2 marks]
- iii. Write a method definition that returns the number of current day of the week. [2 marks]
- iv. Write a method definition that returns the name that corresponds to the current day of the week. If current day is 1, this method returns **Sun**. [Don't use decision statements]. [2 marks]
- v. Write a method definition that returns the name of the next day. [2 marks]
- vi. Write a method or a function definition that returns the name of the previous day. [Use decision making constructs sparingly]. [2 marks]