



*(Knowledge for Development)*

**KIBABII UNIVERSITY**

**(KIBU)**

**UNIVERSITY EXAMINATIONS  
2020/2021 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS**

**FOR THE DEGREE OF  
BACHELOR OF SCIENCE  
(CS, IT)**

**COURSE CODE : CSC 120  
COURSE TITLE : OBJECT ORIENTED  
PROGRAMMING I**

**DATE: 14/07/2021 TIME: 02.00 P.M – 04.00 P.M**

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**INSTRUCTIONS TO CANDIDATES**

**ANSWER QUESTIONS ONE AND ANY OTHER TWO**

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

- a) There are three basic concepts underlying Object Oriented programming. Name and describe them. **[6 marks]**
- b) Complete the following Java method called *welcome* so that it displays on the screen monitor a personalized welcome given a first name. (For example, given the name Nekesa, it will display "Welcome Nekesa") **[2 marks]**
- ```
public..... welcome (String firstName)
{
.....
}
```
- c) Explain what a call to `super ()` does in a constructor of a subclass. **[2 marks]**
- d) Briefly explain the following terms as used in Java: **[2 marks]**
- final method
  - static method
- e) Give the syntax/format of a Java method. **[3 marks]**
- f) Distinguish between late binding and early binding. **[2 marks]**
- g) With respect to a class in Java, distinguish between a static variable and an instance variable **[2 marks]**
- h) Write code segments to create an array called `classList` that stores String objects. **[2 marks]**
- i) Name and describe the four levels of access used in Java. **[4 marks]**
- j) With the help of an example explain what a constructor is distinguishing between default constructor and non-default construct. **[3 marks]**
- k) Describe the principle of information hiding in OOP and explain how it is achieved in Java **[2 marks]**

## QUESTION TWO [20 MARKS]

a) For this question assume the following Box class:

[8 marks]

```
public class Box
{
    private double length;
    private double width;
    private double height;
    public Box(double l, double w, double h)
    {
        length = l;
        width = w;
        height = h;
    } // end Box( )
    public double volume( )
    {
        return length * width * height;
    } // end volume( )
} // end class Box
```

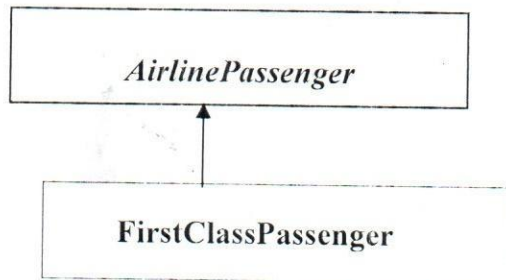
- i. Write the statement to instantiate an Box object, blueBox, with a length of 6, width of 4, and height of 2.
  - ii. Write a statement to output the volume of the blue box.
  - iii. Add a constructor to class Box for a cube, which has only 1 parameter, side.
  - iv. Write a statement to instantiate a cube with a length of 3, width of 3, and height of 3.
- b) Consider a software house that employs several programmers. Each is given a unique payroll number. His name and monthly salary are recorded. The programming language used is also recorded but it is expected to change from time to time. It should be possible to get a display showing the details of each programmer and a monthly salary bill for the software house. It is also specified that if a programmer uses Java then a 20% bonus is awarded. Design a class to model the programmer.

[12 marks]

### QUESTION THREE [20 MARKS]

- a) (i) Distinguish between method overloading and method overriding. [2 mark]  
(ii) How is composition different from inheritance? [3 marks]

b)



Translate the above inheritance hierarchy into Java given the following information: An *AirlinePassenger* has a name and a flight number. The name of the passenger cannot be changed but the flight number may be changed, and might not initially be known. *FirstClassPassenger*'s meal preference has to be specified (meat or vegetarian). All passengers are given an initial luggage allowance of 20kg while first class passengers are given an extra 10kg luggage limit.

[15 marks]

### QUESTION FOUR [20 MARKS]

- a) Distinguish between an abstract class and an interface. [2 marks]
- b) Assume a class *Student* implements a *Speaker* interface. This interface includes two abstract methods, `speak()` and `announce(String str)`. A *Student* contains one instance data, `String yearOfStudy`. Write the *Student* class so that it implements *Speaker* as follows. The `speak` method will output "I am a newbie here" if the *Student* is a "Year 1", "I hate school" if the *Student* is either a "Year 2" or a "Year 3", or "I can not wait to graduate" if the student is a "Year 4". The `announce` method will output "I am a Student, here is what I have to say" followed by the `String` parameter on a separate line. Finally, the `yearOfStudy` is initialized in the constructor. Only implement the constructor and the methods to implement the *Speaker* interface. [12 marks]

- c) Write a short driver program that instantiates the **Student** class and demonstrates that the methods you implemented from the interface behave correctly by using a set of appropriate arguments.

[6 marks]

### QUESTION FIVE [20 MARKS]

Consider the following class definition that represents a thermostatically controlled water heater.

```
public class thermostat
{
    public int temperatureLimit; // from 0 to 30 (celsius)
    public boolean currentHeaterState; // true or false (for on/off)
    public int evaluateState(); // switch on/off as required
    public int getCurrentTemp(); // obtain temperature from sensor
}
```

- a) Provide a redesigned **thermostat** class that uses more appropriate access modifiers. [5marks]
- b) Provide a get and a set method that will enable the **temperatureLimit** instance variable to be retrieved and modified. [5 marks]
- c) Provide a constructor for the **thermostat** class that will initialise the instance variables to suitable (valid) start values. [5 marks]
- d) Write a body for the **evaluateState()** method that enables it to switch on and off the heater (by changing the **currentHeaterState** instance variable) by comparing the current value of **temperatureLimit** with the current temperature, as returned by **getCurrentTemp()** method. [5 marks]