



TECHNICAL UNIVERSITY OF MOMBASA

INSTITUTE OF COMPUTING AND INFORMATICS

UNIVERSITY EXAMINATION FOR:

BSCS/SEP2023/J-FT

CSE 4204: PRINCIPLES OF OBJECT - ORIENTED PROGRAMMING

SPECIAL/SUPPLEMENTARY EXAMINATION

PAPER I

SERIES: JULY 2025

TIME: 2 HOURS

DATE:

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

(a.) A worker is paid a gross weekly wage based upon the number of hours worked per week and the hourly rate of pay. Calculate the net pay for an employee after the following deductions:

- Federal income tax 15% of gross pay
- Social security tax 6.2% of gross pay
- Payroll savings 3% of gross pay
- Retirement pension 8.5% of gross pay
- Health insurance KShs 575 per employee

Write a class called Deductions with two instance variables ratePay and noOfHours - to represent number of hours worked in a week. The class should have a parameterized constructor with two parameters that corresponds to the first two instance variables. Also include a method calculateGrossPay(), that computes and returns the gross pay of the worker.

In addition, the class should have an instance method for each of the corresponding deduction mentioned above and another method for computing the total deductions which will be used in a method called calculateNetPay() that returns as a value the net pay after the deductions.

(13 marks)

- (b.) (i.) Is an accessor method different from a mutator method in a class definition? Explain.
(ii.) As you explain in (i.) above, give the general syntax of each method. Use out of line method definition.

(6 marks)

- (c.) How do we call the constructor of a parent class when defining the constructor of a child class? Give the operator and hence its general syntax.

(4 marks)

- (d.) Explain how the access modifier of an attribute in a parent class affect its derivation to a child class.

(7 marks)

Question TWO

- (a.) Create a class called '**Person**' that contains the following instance variables:

- surname is a string
- othernames is a string
- age is of the type integer
- marital_status is of the type character
- gender is of the type character

The instance variable marital_status can take any of the three characters namely: S for single, M for married and D for divorced.

The instance variable gender also can take any of two characters namely: M for male and F for female.

The class will also include two parameterized constructors as follows:

- The first constructor should accept five parameters, each parameter corresponding to the named instance variable above. Each parameter should be used to assign its corresponding instance variable in the class.
- The second constructor should accept four parameter values corresponding to the surname, othernames, age and gender instance variables. Each parameter should be used to assign its corresponding instance variable in the class. In this constructor the instance variable marital_status should be assigned to the character S for single.

Write a method `displayDetails()`, that will display the values of the instance variables of an object of this class. Its prototype is as follows:

```
public void displayDetails();
```

Then you should also define a custom method called `getMarried` that will accept one string parameter. This method will be of the return type `void` and should change the `marital_status` of a person object to `married` and check if the gender of the person getting married is female, then change the surname instance variable of that person object to the character string parameter value passed. The method prototype for this method is as follows.

```
public void getMarried(string sname);
```

(14 marks)

- (b.) Using the class written above, write a main function that will create two objects called `hamadi` and `amina` using the second constructor for both, the `hamadi` object is a male object while the `amina` object is a female object. Then display the details of each person object using the `displayDetails()` method. Using the object `amina` call the method `getMarried` and pass the surname of the object `hamadi`, then after that display the details of the person object `amina`.

(6 marks)

Question THREE

- (a.) Distinguish between method overriding and method overloading.

(2 marks)

- (b.) A class called `Vehicle` is required. An object of the class `Vehicle` will consist of the following data attributes:

- registration number of type string
- make of the vehicle of type string
- year of manufacture of type integer and
- current value of the vehicle of type float.

A constructor is required which will accept three parameters to assign the first three attributes. Then write an accessor and a mutator method for the current value of the vehicle. Then write three accessor methods for the other three data attributes. In addition, a method (call it `vehAge`) is needed which accepts as an argument a year and returns the age of the vehicle.

Write a child class of `Vehicle` called `SecondHandVehicle`, which has an additional attribute, `numberOwners`, which needs to be initialized at the time of creation and read access is also required. Also include in this child class an additional method (call it `repOwners`) that is

required to return as a string a message telling us whether the vehicle has had more than one previous owner.

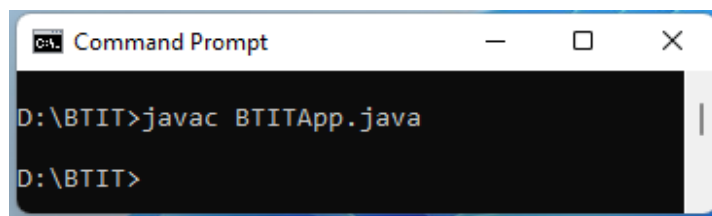
(18 marks)

Question FOUR

- (a.) (i.) In your own words briefly explain the term object oriented system.
(ii.) Why is object interaction important in an object oriented system? Explain. (4 marks)
- a.) (i.) Define the term stream.
(ii.) Give the two stream objects required to read and write a typical serial access file in Java. (4 marks)
- (b.) (i.) What is a class? Define.
(ii.) Give the elements that constitutes a class definition.
(iii.) Give the general syntax of a class definition. (6 marks)
- (c.) (i.) Define the term access modifier.
(ii.) Give the three access modifiers used in any object - oriented language. (4 marks)
- (d.) Give the properties that distinguish a strongly typed language like Java from any other language. (2 marks)

Question FIVE

- a.) The diagram below depicts a typical case of compiling a Java program, on the command prompt:



```
cmd Command Prompt
D:\BTIT>javac BTITApp.java
D:\BTIT>
```

- (i.) In your own perspective, did the Java source code compile?
(ii.) If it compiled, how can we further investigate that at the command prompt?
(iii.) What is the expected name of the Java bytecode in the above compilation? (3 marks)
- b.) Give the corresponding Java API for each of the following classes:
(i.) Scanner
(ii.) Math (2 marks)

- c.) Briefly describe two properties of Java makes it unique from C++ as a programming language.
(2 marks)
- d.) i. Which are the two interpreters that offered in a typical JDK installation that may be used execute a typical Java bytecode file?
ii. Give the two types of applications that one may create using Java.
(4 marks)
- e.) i. Give the general structure of the method header for the main method of an application class in Java.
ii. Briefly describe why the values of the first three elements of the main method header are the way are.
(5 marks)
- (a.) (i.) What is inheritance?
(ii.) Give the other three names that we give to the class we inherit from apart from parent.
(4 marks)