

CHUKA UNIVERSITY
SECOND YEAR SECOND SEMESTER EXAMINATIONS FOR
BACHELORS OF SCIENCE IN APPLIED COMPUTER SCIENCE

ACSC 328: OBJECT ORIENTED PROGRAMMING (IN C++)

INSTRUCTIONS

- 1 Answer **all questions** in section A and any other **two questions** from section B.
- 2 No Reference Material is allowed in the exam Room.
- 3 All Mobile phones should be switched off in the exam room.
- 4 Write legibly on both sides of an answer sheet.

SECTION A (COMPULSORY)

QUESTION 1 (COMPULSORY) [30 MARKS]

- a) Differentiate between the following terminologies as used in object oriented programming.
 - i) Object and class (3marks)
 - ii) Methods and Instance variables (3marks)
- b) With help of sketch diagrams, explain FIVE forms of inheritance (5marks)
- c) Using structures, write a code that prompts a user to enter full name, age, and salary (6marks)
- d) Below is a code that uses function overloading. Use it to answer the questions that follow.

```
#include<iostream>
using namespace std;

int sum(int a,int b)
{
    return a+b;
}

int sum(float a, float b){
    return a+b;
}

int main()
{
    cout<<sum(1.3, 2.7);
    return 0;
}
```

- i) Explain the term function overloading (2marks)
- ii) The above code on compilation returned an error. Where is the error? (2marks)

iii) If the error is corrected. What is the expected output when compiled successfully?
(2marks)

e) The following object oriented code has a base class base, with three other classes inheriting variables from the base class. Use it to answer the questions below: -

```
class base
{
    public:
        int x;
    protected:
        int y;
    private:
        int z;
};

class publicDerived: public base
{
    // inherit variables
};

class protectedDerived: protected base
{
    // inherit variables
};

class privateDerived: private base
{
    // inherit variables
}
```

- i) List how variables x, y and z will be inherited by class publicDerived?
(2marks)
- ii) List how variables x, y and z will be inherited by class protectedDerived?
(2marks)
- iii) List how variables x, y and z will be inherited by class privateDerived?
(2marks)
- iv) Why do we refer to class base as the base class?
(1mark)

SECTION B (Answer two question from this section)

QUESTION 2 [20 MARKS]

- a) Explain THREE standard libraries that can be used with object oriented programming.
(6marks)
- b) Write a code that uses abstraction, hence provide the output when run.
(6marks)

- c) Using polymorphism, write a code with base class shape and two derived classes class rectangle and class triangle. The code should be able to calculate either the area of a rectangle or area of a triangle, based on the parameters passed in at the main function. (8marks)

QUESTION 3 [20 MARKS]

- a) Below is a sample code. Use it to answer the questions that follow.

```
#include <iostream>
using namespace std;

class Main
{
    public:
    int sum(int x, int y)
    {
        return x + y;
    }
    int sum(int x, int y, int z)
    {
        return x + y + z;
    }
};

int main()
{
    ComputeSum obj;
    cout << "Sum is " << obj.sum(10, 20) << '\n';
    cout << "Sum is " << obj.sum(10, 20, 30) << '\n';
    return 0;
}
```

- i) Write the output of this code when run. (2marks)
- ii) What type of binding is noted when the class is called at the main function. Explain? (3marks)
- b) Write a C++ program using FUNCTION(s) that will prompt a user to choose the operation choice (from 1 to 5) from the calculator menu choices item. Then it asks the user to input two integer values for the calculation, and perform the selected operation on the entered integers. (See a sample output window below).

```
CALCULATOR MENU CHOICES
1. Add
2. Subtract
3. Multiply
4. Divide
5. Modulus

Enter your choice: 2
Enter your two numbers: 22 15
Result: 7
```

The program also asks the user to decide whether he/she wants to continue the operation. If he/she input 'y', the program will prompt the user to choose the operation again. Otherwise, the program will terminate. (15 marks)

QUESTION 4 [20 MARKS]

- a) Using an example in each case, differentiate between a structure and a class (6marks)
- b) Explain FOUR rules of using a destructor in Object oriented programming. (4marks)
- c) With reference to encapsulation, answer then following questions.
 - i) Explain THREE benefits of encapsulation in Object oriented programming (3marks)
 - ii) Write code that returns factorial of a number entered using encapsulation. (7marks)

QUESTION 5 [20 MARKS]

- a) Explain the following features of object oriented programming.
 - i) Abstraction (2marks)
 - ii) Encapsulation (2marks)
 - iii) Inheritance (2marks)
 - iv) Polymorphism (2marks)
- b) Write a code that incorporates a constructor and a destructor. Hence give the solution expected when run. (6marks)
- c) Study the following code and answer the following questions.

```
#include <iostream>
using namespace std;

class Rectangle {
    int width, height;
public:
    Rectangle() {}
    Rectangle (int x, int y) : width(x), height(y) {}
    int area() {return width * height;}
    friend Rectangle duplicate (const Rectangle&);
};

Rectangle duplicate (const Rectangle& param)
```

```
{
    Rectangle res;
    res.width = param.width*2;
    res.height = param.height*2;
    return res;
}

int main () {
    Rectangle foo;
    Rectangle bar (2,3);
    foo = duplicate (bar);
    cout << foo.area() << '\n';
    return 0;
}
```

- i) What friend classes? (2marks)
- ii) Explain TWO benefits of declaring friend classes (2marks)
- iii) In the above code, which class is a friend of which? (2marks)