

# **UNIVERSITY OF ESWATINI**

## **FACULTY OF SCIENCE & ENGINEERING**

**DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING**

**RESIT EXAMINATION**

**JULY 2019**

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**TITLE OF PAPER:   PROGRAMMING TECHNIQUES II**

**COURSE CODE:     EEE272**

**DURATION:         3 HOURS**

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### **INSTRUCTIONS:**

1. There are five (5) questions in this paper. Answer question 1 and any other three (3) questions.
2. Each question carries equal marks.
3. Use correct notation and show all your steps clearly in any program analysis.
4. All programs should be sufficiently commented and indented for clarity.
5. Start each question in a new page.

**This paper should not be opened until permission has been given by the invigilator.**

**This paper contains four (4) pages including this page.**

## Question 1

- a. How are overloaded functions differentiated from each other when a program is executed? [2]
- b. Define the principles of encapsulation and information hiding in object oriented programming. How does the definition of classes promote these principles? [4]
- c. Explain why a class might provide set and get functions to update and access data members. [2]
- d. What is the purpose of access specifiers? Explain the access control level provided by each access specifier. [6]
- e. Explain why data members, in particular should be placed in the private section of a class. [2]
- f. By using an example explain the difference between a base class and a derived class. [2]
- g. What is a default class constructor? Describe two ways by which it can be created. [4]
- h. What is the role of a destructor in a class? [3]

## Question 2

- a. Explain the difference between function overloading and overriding. [2]
- b. Provide the syntax to declare a C++ **class B** to be a public base class for derived **class D**. [2]
- c. What is this pointer? By way of illustration give two instances where you may be required to use this pointer. [5]
- d. Explain the following C++ concepts; [6]
  - i. friendship
  - ii. Operator overloading
  - iii. Public inheritance
- e. What is the rationale behind separating class interface from implementation? [2]
- f. Why is it that operator<< cannot be overloaded as a member function? [2]
- g. How is a postfix unary operator++ differentiated from the prefix version? [2]
- h. What is the difference between class composition and inheritance? [2]
- i. Give two reasons for using friendship in operator overloading? [2]

### Question 3

- a. Based on the shown member function prototype, describe how the member function operates. [5]

```
int get(const char&, const int) const;
```

- b. In the class, it was mentioned that the operator+ for an expression such as `10 + Simple(3)` cannot be overloaded as a member function. Why is it so? Write a simple code that includes a class with data members and member functions to illustrate how the operator could be appropriately overloaded for the given expression. [10]
- c. When a derived class inherits from a base class, how is the base class constructor called? [3]
- d. Write statements for creating a dynamic array that stores 10 integer elements. [3]
- e. Suppose we have a **class D** derived from base **class B**,

```
class B
{
public:
    // other members
    void func();
    // other members
};
void B::func() { /* body */}
class D: public B
{
public:
    // other members
    void func();
    // other members
};
void D::func() { /* body */}

int main(){
    D dObj;
    //other statements
}
```

Make the following call using `dObj` as calling object:

```
dObj.func();
```

Which version of `func` is called? Explain your answer. [4]

#### Question 4

Write a complete C++ program to do the following:

- Student is a base class, having two data members: entryno and name; entryno is an integer and name is of type characters, 20 characters long. The value of entryno is 1 for Science student and 2 for Arts student, otherwise it is an error.
- Science and Arts are two derived classes, having respectively data items marks for science and marks for arts.
- Read appropriate data from the keyboard for 3 science and 2 arts students.
- The two derived classes have members function display which is used to display entryno, name, marks for science students first and then for arts students.

- i. Write the C++ interface. [5]
- ii. Write the C++ implementation. [15]
- iii. Write a C++ driver program for the class [5]

#### Question 5.

Write a complete C++ program that uses class rectangle and point. Class rectangle only stores Cartesian coordinates of type point for the four corners of the rectangle. The class must include a set function that does the following:

- Before assigning the sets of coordinates to data members, it must verify that they are in the first quadrant with no single x or y coordinate larger than 20.0.
- It must also verify that the supplied coordinates specify a rectangle.

Other member functions include:

- A constructor that uses the set function to initialise the coordinates.
- Member functions to calculate length, width, perimeter and area.
- A member function which determines whether the rectangle is a square.

- i. Write the C++ interface. [5]
- ii. Write the C++ implementation. [15]
- iii. Write a C++ driver program for the class [5]

**End of paper**