



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 2, Examination in Engineering, February 2020

Module Number: EE2201 Module Name: Computer Programming II

Part B

[2 hours]

[Answer all questions]

Q1. a) Explain the use of constructor and destructor of a C++ class.

[1 marks]

b) The following C++ class which describe a 3 dimensional point has syntax errors. Rewrite the following C++ program so that it will be compiled by a standard compiler.

[3 marks]

Listing 1: Point Class

```
class Point
{
    int _x, _y, _z;

    Point() {
        _x = 0; _y = 0 ; _z = 0 ;
    }

    void print() {
        cout << "Point :" << _x << _y << _z << endl;
    }
};

int main() {
    Point p(1, 2, 3);
    p.print();
}
```

c) Add a parameterized constructor so that different values for 3 coordinates can be initialized when creating a Point object.

[1.5 marks]

d) Rewrite the C++ class you wrote in section Q1c) in two files Point.h and Point.cc such that all of the members of the class are declared in the header file but the complete function definitions are written in the Point.cc file. Use comments to indicate clearly the file names. Appropriate header files should be included.

[3 marks]

e) Overload the operator + so that two points can be added together. The result of the operator should be another point with each coordinates added together.

[1.5 marks]

Q2. a) Describe the following terms found in Object Oriented Programming.

- i) Abstraction
- ii) Polymorphism

[2 marks]

b) Implement the following tasks using C++ syntax.

- i) Create a Person class with Name and Age in years and months as member variables.
- ii) Create a parameterized constructor to Person class Name and Age as input parameters.
- iii) Inherit Student class from Person class and include registration numbers and Array of modules. Each module should have a Number, Credit Value and Grade.

[3 marks]

c) Explain the difference between data stored on the stack and on the heap.

[1 mark]

d) An array ARY of size N integers should be created using C++ language.

- i) Create the array using dynamic memory allocation.
- ii) Using pointer notation assign array with random numbers between 0 and 1000. (Assume rand()% 1000; returns a random number and all required libraries have been included.)
- iii) Write a function which takes array and the size of the array as input parameters and outputs the minimum and the maximum of array.

[4 marks]

Q3. a) Write a class named Complex to store a complex number according to the following requirements.

- i) Include two member variables *imag* and *real* to represent imaginary and real parts.

- ii) Create an empty constructor and parameterized constructor.
- iii) Overload + operator for complex numbers.
- iv) Overload « operator so that it can be used with standard output stream cout.

[5 marks]

b) Write a class Vector using C++ syntax with the following requirements.

- i) A pointer variable to hold array of floating point numbers as a member variable.
[0.5 mark]
- ii) A parameterized constructor which takes *size* of the Vector as a parameter and allocate memory dynamically and initialize each element of the vector to zero.
[2 marks]
- iii) A member function which returns the magnitude of the vector as a scalar. The magnitude of vector v is defined as

$$|v| = \sqrt{\sum_{i=1}^N v_i^2}$$

where N is the size of the vector and v_i is the i^{th} element of the vector v .

[1.5 marks]

- iv) Create an appropriate destructor for the Vector class.

[1 mark]