



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 2, Examination in Engineering, January 2019

Module Number: EE2201 Module Name: Computer Programming II

Part B

[2 hours]

[Answer all questions]

- Q1. a) Write three differences between a constructor and a method in a class? [1.5 marks]
- b) What is the difference between class and a structure in C++? [1 mark]
- c) Explain *method overloading* by using an example. [1.5 marks]
- d) Explain the following access modifiers.
- i) public
 - ii) private
- [1 mark]

- Q2. a) Write a structure named *Point* with x and y coordinates to represent a Cartesian 2D point using C++ syntax. [1 marks]
- b) Write a class *Vector* using C++ syntax with following requirements.
- i) A pointer variable to hold array of *Point* structures as a member variable. [0.5 mark]
 - ii) A parameterized constructor which takes *size* of the *Vector* as a parameter and allocate memory and initialize x and y coordinates of each point 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

$$|v| = \sqrt{\sum_{i=1}^N x_i^2 + y_i^2}$$

where N is the size of the vector. [1.5 marks]

Q3. a) Describe the following terms found in Object Oriented Programming.

- i) Encapsulation
- ii) Inheritance

[2 mark]

b) Implement the following using C++ syntax.

- i) Create a Shape class with Color and Area as member variables.
- ii) Create a parameterized constructor to Shape class to get color as input parameter.
- iii) Inherit Circle class from Shape class and include Radius as member variables.
- iv) Create parameterized constructor to circle class which accept radius and color as parameters.

[3 mark]

Q4. a) Explain the difference between regular variable and pointer type variable in C++.

[1 marks]

b) An array ARY of 10 integers is created using C++ language.

- i) Show the memory representation of the array and variable ARY using a diagram.
- ii) What is the meaning of $*(ARY + 5)$
- iii) Explain using a diagram, what happens when the expression `int* A = ARY;` is executed.

[3 marks]

c) Write a method which takes two integers as input parameters and swap the values of those variables using pointer variables.

[1 mark]

Q5. a) What is meant by dynamic memory allocation in C++.

[1.5 marks]

b) Create a class called Matrix to represent two dimensional matrices using C++ syntax. The matrix should store double precision floating point numbers.

c) Provide a constructor which takes number of rows and number of columns as parameters. The constructor should allocate memory and initialize all the numbers to zero.

[2 marks]

d) Create a destructor which deallocate all the allocated memory.

[1.5 marks]

Q6. a) Explain operator overloading in C++.

[1 mark]

b) A Vector class stores data in an array of floating point numbers of size N .

i) Overload the $+$ operator for that vector class where we add similar size vectors element by element and return a new vector of same size. For example we must be able to add two vectors as $v = v_1 + v_2$.

[2 marks]

ii) Overload the $*$ operator for that vector class where we multiply two vectors of same size element by element and add them together and return the result. For example we must be able to find the dot product of two vectors as $x = v_1 * v_2$.

[2 marks]

