BSc. (Hons) Software Engineering /
BSc. (Hons) Business Information System
SE2113 & BIS2115
Object Oriented Programming Techniques
Examinations for 2002 – 2003 / Semester 1

Duration: 2 Hours

Instructions to Candidates:

1. Answer all questions.
2. Questions may be answered in any order but you must indicate clearly the question number.
3. Start your answer to each question on a fresh page.
4. This paper carries a total of 75 marks.

This question paper contains 3 questions and 4 pages.
QUESTION 1 [Total marks : 30]

a) i) Construct a class Time with three private data members: hour, minute and second. [2]
   ii) Add appropriate constructors and methods. [7]
   iii) Write a method to overload operator + so that the following operation can be possible.
        \[ t2 = t1 + \text{minutes} \] where \( t1 \) and \( t2 \) are objects of class Time and minutes > 0. [6]
   iv) Write a method to overload operator \( >= \). For example if \( t1 >= t2 \). [4]

b) i) Write a class Matrix which consists of two private data members, rows and columns
       and a pointer to integer. [1.5]
   ii) Write a constructor with two arguments. The arguments values are assigned to data
       members row, column and the pointer to integer is converted to an array of integers
       with rows X columns locations and are used to store elements of the matrix. [2.5]
   iii) Write a method to input elements in the matrix. [2]
   iv) Design an algorithm or explain how you would perform multiplication of two
       matrices. [5]

QUESTION 2 [Total Marks : 15]

Merry Greeting is a small company that sells greeting cards by mail order. Their customers
are mostly individuals who place small regular orders, but Merry Greeting also sells
wholesale to large card shops. The company stock consists of basic cards, which are sold
without any message inside, but which may be personalised if the customer wishes. In this
case the customer chooses a suitable message from the company’s list, plus a typeface and a
colour for printing. Payment must be sent with the order in the case of individual customers;
wholesale customers are allowed credit.

Draw a class diagram to represent this information. Your classes should include at least one
data member and a method and where appropriate your diagram should include association,
aggregation, inheritance and multiplicity. [15]
**QUESTION 3 [Total Marks : 30]**

a) Define an abstract class. What is the purpose of an abstract class. [3]

b) What is a pure virtual function? [2]

c) Explain the term polymorphism. Give an example using C++. [8]

d) Describe multiple inheritance. Illustrate multiple inheritance with an example of your own using C++. [9]

e) Consider the following class definition.

```cpp
class counter
{
    private:
        int count;
    public:
        counter()
        {
            count = 0;
        }
        void increment()
        {
            ++count;
        }
        int getCount()
        {
            return count;
        }
        void setCount(int c)
        {
            count = c;
        }
};
```

Using inheritance, implement a method that will decrease the value of count by one. [4]
Consider the following program:

```cpp
#include <iostream.h>
class A
{
  private:
    int x,y;
  public:
    A()
    {
      x=y=0;
    }
  virtual void play()=0;
  void tune()
  {
    cout << "Tune";\n  }
};

class B : public A
{
  public:
    void broadcast()
    {
      cout << "broadcast";
    }
};

void main()
{
  B z;
  z.broadcast();
  z.tune();
}
```

Explain why the above program will not compile?