



BSc EXAMINATION

School of Computing

2 hours

August 2011

Applied Computing 2A (AC21003)

This paper contains THREE questions.

Questions carry different marks.

Answer ALL questions.

Only calculators approved by the School for exam use may be used in this exam.

Question 1 (33 marks)

a)

- (i) Explain the purpose of the instruction `using namespace std;` in a C++ program.

[4 marks]

- (ii) Explain the purpose of the instruction `return 0;` in a C++ program.

[4 marks]

b)

Consider the following class declaration:

```
class CRectangle {  
    int x, y; // the lengths of the sides  
public:  
    void set_values (int,int);  
    int area (void);  
} rect;
```

- (i) Write code for the method `area()`, which must return the area of the rectangle.

[5 marks]

- (ii) Write code for the method `set_values()`, which inputs the lengths of the sides.

[5 marks]

- (iii) Write a main function which inputs values for the sides and outputs the area of the rectangle.

[5 marks]

(question continues on next page)

- c) Consider the following, alternative definition of the class `rectangle`, in which `duplicate()` simply copies the rectangle's dimensions to a different rectangle.

```
class CRectangle {  
    int width, height;  
    public:  
        void set_values (int, int);  
        int area () {return (width * height);}  
        friend CRectangle duplicate (CRectangle);  
};
```

- (i) Explain the meaning and effect in the code of the keyword `friend`.

[4 marks]

- (ii) Write the body of `duplicate()`.

[6 marks]

Question 2 (33 marks)

Consider the following C++ code.

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

1. int main ()
2. {
3.   int i,n;
4.   int * p;
5.   cout << "How many numbers would you like to type? ";
6.   cin >> i;
7.   p= new int[i];
8.   if (p == 0)
9.     cout << "Error: memory could not be allocated";
10.  else
11.  {
12.    for (n=0; n<i; n++)
13.    {
14.      cout << "Enter number: ";
15.      cin >> p[n];
16.    }
17.    cout << "You have entered: ";
18.    for (n=0; n<i; n++)
19.      cout << p[n] << ", ";
20.    delete[] p;
21.  }
22.  return 0;
23. }
```

- (a) Briefly explain the main purpose of the code.

[8 marks]

- (b) Explain the purpose and effect of line 7 and 20.

[8 marks]

- (c) What problem might be caused by omitting line 20 in a program in which instances of line 7 are executed frequently?

[9 marks]

- (d) How would you modify the code so that number input stops when the user enters a special character?

[8 marks]

Question 3 (34 marks)

- a) Explain what is meant by *local scope* and *global scope* for a variable.

[6 marks]

- b) Consider the following program.

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

void duplicate (int& a, int& b, int& c)
{
    a*=2;    b*=2;    c*=2;
}

int main ()
{
    int x=1, y=3, z=7;
    duplicate (x, y, z);
    cout << "x=" << x << ", y=" << y << ", z=" << z;
    return 0;
}
```

- (i) What is the output of this code, and why?

[5 marks]

- (ii) What is the name of the technique used to pass parameters from the `main` to `duplicate()`?

[2 marks]

- (iii) What would the output be if `duplicate()` were defined as in the following line, and what is this second technique called?

```
void duplicate (int a, int b, int c)
```

[6 marks]

- c) Write a *recursive* C++ function which calculates the factorial of a number, and a main program which reads numbers from the keyboard and prints the factorial until the user enters the number zero.

[15 marks]

End of Exam

