EASTERN UNIVERSITY, SRILANKA

DEPARTMENT OF MATHEMATICS

SECOND EXAMINATION IN SCIENCE — 2008/2009

SECOND SEMESTER (Oct. /Nov., 2010)

CS104 — Object Oriented Programming Techniques

Answer all questions   **Time: 2 Hours**

1.

i. Explain the difference between a **public** member, a **private** member and a **protected** member of a class.
(6 Marks)

ii. Using the concepts of **class** and **functions,** write a program in C++ to input and display employee's name, emp_no, salary for 10 employees.
(7 Marks)

iii. Define a class to represent a bank account including the following members:

Data members
   a. name of the depositors.
   b. account number.
   c. type of account.
   d. balance amount in the account.

Member functions

   a. to assign initial values.
   b. to deposit an amount.
   c. to withdraw an amount after checking the balance.
   d. to display the name and balance.
(12 Marks)

i. Explain the difference between the following pair of terms:
   a. constructor and a destructor;
   b. default constructor and other constructors;
   c. copy constructor and the assignment operator.
(6 Marks)

ii. Write the output of the following program: (9 Marks)

```cpp
#include <iostream.h>
class Student
{
        public:
                Student()
                {
                status = "freshman";
                age = 19;
                cout << "Constructor1" << endl;
                }
                Student(int i)
                {
                status = "senior";
                age = i;
                cout << "Constructor2" << endl;
                }
                Student(const Student & a)
                {
                status = a.status;
                age = a.age + 5;
                cout << "Constructor3" << endl;
                }
                ~Student(){cout << "Destructor" << endl;}
                void show();

        private:
                char *status;
                int age;
};

void Student::show()
        {
        cout << "Status:" << status;
        cout << ", age:"<< age << endl;
        }
void display1(Student a)    { a.show(); }
void display2(Student & a){a.show(); }

void main()
        {
        Student st1(19);
        display2 (st1);
        Student st2, st3(st1);
        display2(st2);
        display2(st3);
        st2 = st1;
        display1(st2);
        }
```

iii. Write a program that has a class named Person. Each object of this class will represent a human being. Data members should include the person's name, the year of birth, and the year of death. Include a default constructor, a destructor, access functions, and a print function.

(10 Marks)
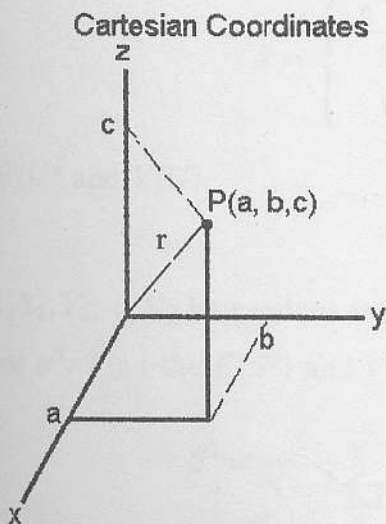
3.

i. What is operator overloading?   (3 Marks)

ii. List out the operators that cannot be overloaded.   (4 Marks)

iii. A vector, in three-dimensional space, <u>r</u> is a set of three coordinates, denoting a position in space. The coordinates are (a,b,c) in Cartesian space.

Complete the following definition and write a main() function to insert a pair of vector objects V_1 and V_2 and to perform the addition and cross product between the pair of vectors.

```
class vector
{
    private:
        int x,y,z;
    public :
        vector(int a=0,int b=0,int c=0);
        vector operator+ (vector);
        vector operator* (vector);
        void display();
        friend istream & operator>>(istream &, vector &);
        friend ostream & operator>>(ostream &, vector &);
};
```

Hint:	Let $\underline{a} = (a_x, a_y, a_z)$ and $\underline{b} = (b_x, b_y, b_z)$
Cartesian Coordinates	Addition: $\underline{c} = \underline{a} + \underline{b}$ Let $\underline{c} = (c_x, c_y, c_z)$ where $c_x = a_x + b_x$ $c_y = a_y + b_y$ $c_z = a_z + b_z$ Cross product: $\underline{d} = \underline{a} \times \underline{b}$ Let $\underline{d} = (d_x, d_y, d_z)$ where $d_x = a_y b_z - a_z b_y$ $d_y = a_z b_x - a_x b_z$ $d_z = a_x b_y - a_y b_x$

(18 Marks)

4.

i. What is Inheritance? Explain any three advantages of inheritance. Explain, with examples, the various types of inheritance. (8 Marks)

ii. What is Polymorphism? How do we attain Run time Polymorphism? Explain with an example. (4 Marks)

iii. Write a program for the following project by using inheritance techniques

A company wishes to prepare a data model for its activities. The company stores information of all its employees.

The common details of all employees are:

Name, date_of_birth, language and nativity.

Additional details of employees based on their placement are stored as:

Stores - date of joining, department, salary.

Scientist - area of specialisation, current project details, paper_presentations.

Technician - height, **weight**, risk factor, wages.

(13 Marks)