

COSC 1305: Final Exam (S)

Name: _____

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1. (20) Answer the following questions

a) (5) Define Encapsulation.

b) (5) Describe the technique called modularity.

c) (5) How does a C++ program handle conversions between two class types? What would happen if we try to compile the following instructions?

```
Student S;  
Employee E = S;
```

d) (5) Add a conversion constructor to the `Employee` class that will resolve the above problem.

2. (20) Consider a student registration application which stores the information about students at the university.

- a) (7) Create a class for the students in the university register. Each **Student** should contain the following data members

```
long id;          // ID number of the product
char name[30];   // Student name
float gpa;       // Student GPA
```

The class should contain a default constructor, a constructor that initializes all data members, constant member functions that return the values of data members, and a function that displays a **Student** object on the screen.

- b) (7) Write an implementation for the **Student** class containing all member functions.

c) (6) Write a short test program that creates and displays several **Student** objects.

3. (20) Answer the following questions

a) (5) If a member of a base class is protected, can it be accessed by functions in its derived classes?

b) (5) Which executes first, the constructor of a derived class, or the constructor of its base class?

c) (10) Consider the following declaration

```
class CMotor {
public:
    CMotor();
    CMotor( const string & id );
    // ...
protected:
    string get_ID() const;
    void set_ID(const string & s);
private:
    string mID;
};

CMotor M;
M.set_ID("12345");           // (A)
M.get_ID();                  // (B)

CElectricMotor::CElectricMotor( const string & id, double volts)
{
    m_nVoltage = volts;
    set_ID(id);              // (C)
}
```

Which of the statements will produce errors?

4. (20) Answer the following questions

a) (5) Write a statement that allocates storage for an array of 50 float values, and assigns the address to the variable p.

b) (5) Which type of variable would use less static storage: A pointer to an array of 100 float, or an array of 100 pointers to float?

c) (10) Consider the following procedure

```
void MySub()  
{  
    Student * pS = new Student;  
  
    // use the Student for a while...  
  
}
```

What happens to the allocation after the procedure exits?

Modify the above procedure to avoid the memory leak.

5. (20) Answer the following questions

a) (5) What is the definition of polymorphism?

b) (5) What is a virtual function?

c) (10) Consider the following declarations

```
class Employee {
public:
    virtual void CalcPay ();
};

class SalariedEmployee :public Employee{
public:
    virtual void CalcPay ();
};

Employee *p0 = new Employee;
Employee *p1 = new SalariedEmployee;
```

Which functions are called by

```
p0->CalcPay();
```

```
p1->CalcPay();
```