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FINAL EXAMINATION
JUNE SEMESTER 2018

ADVANCED PROGRAMMING
(CSC 3530)

(TIME : 3 HOURS)

MATRIC NO.	:							

IC. / PASSPORT NO.	:												

LECTURER : **AMAR SUBEDI**

GENERAL INSTRUCTIONS

1. This question booklet consists of 9 printed pages including this page.
2. **SECTION A:** Answer **ALL questions** in the **ANSWER BOOKLET.**
3. **SECTION B:** Answer **ALL questions** in the **ANSWER BOOKLET.**
4. **SECTION B:** Answer **ONE (1) question** in the **ANSWER BOOKLET.**

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SECTION A   (40 MARKS)

There are **FOUR (4)** questions in this section. Answer **ALL Questions** in the Answer Booklet.

1. Consider the following class `Circle`:

```
Class Circle {
public:
    Circle(double);
    double getRadius();
    double getArea();
    static int countObjects();

private:
    double radius;
    static int count;
}
```

Answer the following questions:

a) Write a definition for the static member variable count.

(2 Marks)

b) Write a function definition for countObjects() which return the number of circle of objects.

(4 Marks)

c) Write a constructor to initialize the member variable, and perform the increment on static member variable count.

(5 Marks)
(PLO2: CLO2: C3)

2. Consider the following class:

```
class Date                              class Birthday
{                                       {
 private:                                public:
    int day;                                 void print(Date &p);
    int month;                          };
    int year;

 public:
    Date(int d, int m, int y)
    {
        day = d;
        month = m;
        year = y;
    }
};
```

A friend function is a function that is not a member of a class, but has access to the class's private members.

Answer the following questions:

a) In order to access the member variables of class Date, the printf() function of class Birthday shall be declared as a friend. Rewrite the above class Date code to include the friend function statement.

(3 Marks)

b) Write a function definition for the class Birthday.

(5 Marks)
(PLO2: CLO2: C3)

3. Consider the following output, and write a program statement to read data from *Record.txt* file (*Note: Values below are declared as a string literal*).

Output to the file named Record.txt
```
Faiz
Male
33
```

(10 Marks)
(PLO2: CLO2: C3)

4. Consider the following class prototype of Square class where the side member is double.

```
class Square
{
    public:
        Square(double s); // to initialize a member variable
        double getSide(); // to return a value of member variable
        double area();    // formula area = side x side
    private:
        double side;      // member variable declaration
};
```

Rewrite the class Square (both prototype and definition) as a template that will accept any data type.

(11 Marks)
(PLO2: CLO2: C3)

SECTION B   (30 MARKS)

There are FIVE (5) questions in this section. Answer ALL questions in the Answer Booklet.

1. Identify the output from the following code:

```cpp
class Length {
    public:
        Length(int feet, int inches)
        {  setLength(feet, inches);  }
        Length(int inches) { len_inches = inches;  }
        int getFeet() { return len_inches / 12; }
        int getInches() { return len_inches % 12 ; }
        void setLength(int feet, int inches)
        {  len_inches = 12 * feet + inches; }

        friend Length operator+ (Length a, Length b);
        friend bool operator< (Length a, Length b);

    private:
        int len_inches;
};
Length operator+ (Length a, Length b)
{  return length(a.len_inches + b.len_inches);    }
bool operator< (Length a, Length b)
{  return a.len_inches < b.len_inches;      }

int main() {
 Length first(0), second(0), third(0);
 first.setLength(6,5);
 second.setLength(3,10)

 third = first + second;
 cout << "first + second = " << third.getFeet() << " feet, "
      << third.getInches() << " inches.\n";

 cout << "first == second ";
 if(first == second) cout << "true";
 else cout << "false";

 return 0;
```

(5 Marks)
(PLO1: CLO1: C1)

2. What is the output of the following?

```
class Alphabet
{
public:
    Alphabet () { cout << "A "; }
    ~Alphabet () { cout << "B "; }
};

class OtherAlphabet : public Alphabet
{
public:
    OtherAlphabet () { cout << "C "; }
    ~OtherAlphabet () { cout << "D "; }
};
```

What is the output if:

a) cout << "E ";
   Alphabet a;
   cout << "F ";

(2 Marks)

b) cout << "E ";
   OtherAlphabet b;
   cout << "F ";

(3 Marks)

c) cout << "E ";
   Alphabet a;
   OtherAlphabet b;
   cout << "F ";

(4 Marks)
(PLO1: CLO1: C1)

3. What is the output by the following program segment?

```
char a[8] = "PROGRAM";
char *ptr = a;
ptr = ptr + 1;
cout << ptr << endl;
cout << ptr + 4 << endl;
cout << --ptr << endl;
cout << ptr << endl;
```

(4 Marks)
(PLO1: CLO1: C1)

4. Consider the following:

```
1    class Employee{
2        public: void id(){cout << "employee ";}
3    };
4    class Doctor : public Employee{
5        public: void id(){cout << "doctor ";}
6    };
7    class Engineer : public Employee{
8        public: void id(){cout << "engineer ";}
9    };
10
11   int main()
12   {
13    Employee *pA[] = {new Employee, new Engineer, new Doctor};
14
15       for(int k=0; k<3; k++)
16          pA[k]->id();
17
18   }
```

Answer the following:
   a) What is the output for the above code?

(2 Mark)

   b) What is the output if:
       i.   Line 2 replace with:
            public: virtual void id(){cout << "employee";}

(2 Marks)

       ii. Line 5 replace with:
            public: virtual void id(){cout << "doctor";}

(2 Marks)

(PLO1: CLO1: C1)

5. What is the output by the following program segment?

```cpp
void update(int a[ ], int b, int &c, int *d) {
    *(a+2) = -2;
    b = 10;
    c = 23;
    *d = a[4];
}

int main( ) {
    int w[5] = {9,8,7,6,5}, x = 4, y = 3, z = 2;
    update(w,x,y,&z);
    cout << "Array w = ";

    for (int k=0; k<5; k++)
        cout << w[k] << ",   ";

    cout << endl << "x = " << x << "    y = "
         << y << "    z = " << z << endl;
    return 0;
}
```

(6 Marks)

(PLO1: CLO1: C1)

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There are TWO (2) questions in this section. Answer ONE (1) question in the Answer Booklet.

1. Write a program that to gather the final examination result students of subject CSC 3530. The program should dynamically allocates an array large enough to hold a user-defined number of test scores. User should enter the test scores for a student, and have a call to the functions which operate the following information:

   - Highest score of a student
   - Lowest score of a student

   Each function created shall return a value.

   (30 Marks)
   (PLO6: CLO3: C5)

2. Given below a class named TestScores:

   ```
   class TestScores
   {
   private:
       int numScores;   // Number of scores
       int *scores;     // Pointer to array of scores

   public:
       // Default constructor
       TestScores()
           { numScores = 0; scores = NULL; }

       // Constructor
       TestScores(int [], int);

       // getAverage function
       double getAverage() const;
   };
   ```

   Rewrite and complete the class TestScores. The class constructor is to accept an array of test scores as its argument. The class have a member function that returns the average of the test scores. Provide the exception class to perform the test scores error. If any test scores in the array is negative or greater than 100, the class should throw an exception. (*Note: No demonstration file is needed*).

   (30 Marks)
   (PLO6: CLO3: C5)

** END OF QUESTIONS ***