

Answer questions as indicated. Closed book/Closed Notes/ NO PDAs (calculators, handhelds, cell phones, etc.) allowed.

## 1 Basic Concepts—20 points

Circle the correct answer. Each problem in this section is worth 2 points. If you are using a pen and need to change your answer, *write* true or false to the right of the question.

## 2 Program Analysis—20 points

Problem 1. There are numerous errors in the program below. **Circle only ten and describe why it is an error.** There is at most one error per line. Each error is worth two points.

```
/* test2.cpp */
#include <ostream.h>
#include <iomanip.h>
#include <stdlib.h>

int isPrime( long n );

int main()
{
    int nPrimes = 0
    ofstream oFile;
    oFile.open( primes.out, 'ios::out' );
    oFile >> "Primes:\n";

    /* count primes */
    for( long i = 2 : i <= 1000000 : i += 1 )
    {
        if( isPrime(i) )
            nPrimes =+ 1;
    }

    oFile << '\t' << setw(7) << nPrimes << endl;

    return 0;
}
```

```

int IsPrime( long n )
{
    int i == 2;
    while( i < n/2 )
        if( n % i == 0 )
            return 0;
        i++;

    return 1;
}

```

### 3 Program Output Analysis—24 points

Fill in the blank. Each problem in this section is worth 4 points.

Problems 12–14 refer to the following code fragment.  $x$  and  $y$  are integer variables.

```

if( x >= 5 && y <= 2 )
    cout << x - y;
else if( x <= 1 && y >= 2 )
    cout << x * y;
else
    cout << y / x;

```

Problem 2. What is the output if  $x = 2$  and  $y = 3$ ? \_\_\_\_\_

Problem 3. What is the output if  $x = 5$  and  $y = 2$ ? \_\_\_\_\_

Problem 4. What is the output if  $x = 1$  and  $y = 3$ ? \_\_\_\_\_

Problems 15 and 16 refer to the following program.

```

int main()
{
    int i, j = 3;
    for( i = 1 ; i < 10 ; i += 3 ) {
        j = func( i, j );
    }
}

int func( int j, int i )
{
    if( i*3-j%3 <= 5 )
        cout << "B I: " << i++ << " " << j++ << endl;
    else
        cout << "B II: " << ++i << " " << j << endl;

    return ++j;
}

```

Problem 5. \_\_\_\_\_

Problem 6. \_\_\_\_\_

Problem 7. \_\_\_\_\_

## 4 Functions—20 points

For all problems in this section, show all additional variable names and types that you choose to use. Use meaningful function names!

Problem 8 (5 points). Write a function that will print a table of the floor function `floor( x )`, for  $x = 0.0$  to  $10.0$  in increments of  $0.1$ . Output is to be written to an output file stream.

Problem 9 (7 points). Write a function to test if a character is a valid starting character for an integer variable for the Fortran language. Integer variables must start with the letters i..n. Both lower and upper case letters are valid. There is no I/O in the function.

Problem 10 (8 points). Write a function that will find and return the minimum, maximum, and average of four real numbers. There is no I/O in the function.

## 5 Program—16 points

Show and use meaningful names (function and variables that you use when writing this program.

Problem 11. Write a *complete* program that counts the number of student absences. The attendance data is stored in a text file, one student record per line (see sample below). Missing dates start with a `/` and excused absences end with a `*`. Your program must include a function to calculate the number of absences.

**Hints:** Recall that the end of line character is `'\n'`. The number of absences is the number of missing dates minus the number of excused absences.

```
Jeff Smith      /17* /24
Andy Martin    /17
Joe Pyle                /29
Mary Rosen     /17*      /27* /29
Carl Zimmer    /24* /27
                October      November
```

**Design: (6 points)**

**Program: (10 points)**

**Bonus Problem:** Two points.