National University of Computer and Emerging Sciences

School of Computing **Fall 2013** **Islamabad Campus**

CS101

Introduction to Computing

Saturday, November 2, 2013

Course Instructor

Dr. Shahzad Rajput and Dr. Sibt ul Hussain

Serial No:

Sessional I

Total Time: 1 Hour

Total Marks: 100

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Signature of Invigilator

Student NameRoll No Section Signature

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Attempt all of them. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work. Use the back of the last page for rough work.
3. If you need more space write on the back side of the paper and clearly mark question and part number etc.
4. After asked to commence the exam, please verify that you have eight (8) different printed pages including this title page. There are total of 5 questions.
5. Use of **calculator** is strictly **prohibited.**
6. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.
7. Use **proper indentation** while writing code and make sure that your code is legible. Failing to do so can cost you marks.

	Q-1	Q-2	Q-3	Q-4	Q-5	**Total**
Marks Obtained						
Total Marks	20	20	20	20	20	**100**

Vetted By: ______________________________Vetter Signature: ______________________

Q. No. 1

20

(a) What is the binary representation of 2050_{10}?

2.5

(b) What is the hexadecimal representation of 427_8?

2.5

(c) Given that 120_{10}= $0111\ 1000_2$, what is the signed binary representation of -125_{10}?

2.5

(d) Given that $3584_{10} = 7*2^9$, what is the binary representation of 3599_{10}?

2.5

(e) What is the 16-bit approximation of -11101.1101110110111_2 in normalized binary form using the following convention?

5

Sign of mantissa = left most bit (where 0: +; 1: -)
Mantissa = next 11 bits, leading 1 is hidden, really represents 12 bits
Exponent = next four bits, bias 7

(f) Interpret the normalized binary number

$$1101\ 1010\ 0000\ 1101_2$$

using the convention mentioned below:

5

Sign of mantissa = left most bit (where 0: +; 1: -)
Mantissa = next 11 bits, leading 1 is hidden, really represents 12 bits
Exponent = next four bits, bias 7

Find its decimal equivalent.

Q. No. 2

/20

(a) What is the output of the following C++ code?

/5

```
int j = 31234;
for( int i=1; i<=5; i++ ){
        if( i%2 )
                if( i%4 )
                        j += 4;
        else
                j+=10;
}

cout << j << endl;
```

Output:

(b) What is the output of the following C++ code?

/5

```
char options[]
      = { 'a', 'b', 'c', 'A', 'B', 'C' };

for( int i = 0; i <= 5; i++ ){
        switch( options[ i ] ){
                case 'a':
                case 'A':
                        cout << "C";
                        break;
                case 'b':
                case 'B':
                        cout << "S";
                case 'c':
                        cout << "B";
                        break;
                default:
                        cout << "A";
        }
}
```

Output:

(c) What is the output of the following C++ code?

10

```
        int i = 1;
        do{
                for(int j=i; j<=3; j++){
                        int k = j;
                        while( k <= 3 ){
                                if( ( i<=3 &&
i>=2 ) || j<3 )
                                        cout
<< "A" << i;
                                else
                                        cout
<< "B" << i;
                                k++;
                        }
                        cout << endl;
                }
                cout << "K" << endl;
                i++;
        }while( i <= 3 );
```

Output:

20

Q. No. 3

a) Write a nested `while` loop that displays the following output on screen:

```
5 4 3 2 1

3 2 1

1
```

10

b) Write a nested `for` loop that displays the following output on screen:

```
5   6
5   7
5   8
6   7
6   8
7   8
8   8
```

10

Q. No. 4

/20

Write a complete C++ program that lets the user enter two 3x3 matrices containing integer values, store these matrices in two two-dimensional arrays. The program should then display the sum of these matrices [Recall from your Linear Algebra course that sum of two matrices is computed by taking sum of their corresponding individual elements].

Q. No. 5

20

Write a program that finds the **square root** of a number X using **bisection method (or binary search method)**. Bisection method is a very simple and popular method. It is used in many real world situations to find a number with a certain property. The algorithm for bisection method work as follows.

First of all you assume a broad search interval [low, high] in which your result (in our case square root) falls. Then in each iteration you reduce the size of your search interval until you find the answer. To reduce the size of your search interval you find the mid value of the search interval (i.e. mid= (a+b) / 2) and check whether your answer lies in the range [low, mid] or [mid, high]. If the answer lies in the interval [low, mid] you reset your search interval in the next iteration to [low, mid], otherwise to [mid, high].

For example, for X=25, bisection method will generate following iterations.

```
low= 0.0 high= mid= 12.5 ans = 12.5
low= 0.0 high= mid= 6.25 ans = 6.25
low= 0.0 high= mid= 3.125 ans = 3.125
low= 3.125 high= mid= 4.6875 ans = 4.6875
low= 4.6875 high= mid= 5.46875 ans = 5.46875
low= 4.6875 high= mid= 5.078125 ans = 5.078125
low= 4.6875 high= mid= 4.8828125 ans = 4.8828125
low= 4.8828125 high= mid= 4.98046875 ans = 4.98046875
low= 4.98046875 high= mid= 5.029296875 ans = 5.029296875
low= 4.98046875 high= mid= 5.0048828125 ans = 5.0048828125
low= 4.98046875 high= mid= 4.99267578125 ans = 4.99267578125
low= 4.99267578125 high= mid= 4.99877929688 ans = 4.99877929688
low= 4.99877929688 high= mid= 5.00183105469 ans = 5.00183105469

5.00030517578 is close to square root of 25
```