

The American University in Cairo
Computer Science & Engineering Department
CSCE 1001

Instructor:	Final Exam	Fall 2014
Last Name :		ID:
First Name:		Form I- Section No. ()

EXAMINATION INSTRUCTIONS

- * Do not turn this page until asked to do so.
- * Exam time is **120** minutes.
- * Put the answers on the same question sheet, do not use any additional papers, even for scratch.
- * Write your name, ID, section no. in the indicated places.
- * Read the exam instructions.
- * Read the honesty policy.
- * Sign the following statement.

Academic Integrity Policy

Cheating in Exams is a violation of the honesty policy of AUC. Whispering, talking, looking at someone else's paper, or copying from any source is considered cheating. Any one who does any of these actions or her/his answers indicates that she/he did any of them, will receive a punishment ranging from zero in this exam to failing the course. If repeated, it may lead to dismissal from AUC.

I have read the honesty policy and exam instructions and I am presenting this exam as entirely my effort.

Signature: _____

DO NOT USE THIS SECTION

Question	Points	Grade
1	10	
2	20	
3	20	
4	15	
5	15	
6	20	
Total	100	

Question 1 (10 points)

Tick only one possible answer for each of the following:

- 1) In binary: $1111 + 11001 = ?$
 - a. 101000 ☐
 - b. 100110 ☐
 - c. 110110 ☐
 - d. none of the above ☐
- 2) The Boolean expression **!((x > 4) && (x < 10))** can be simplified into:
 - a. (x <= 4) && (x >= 10) ☐
 - b. (x < 4) && (x > 10) ☐
 - c. (x <= 4) || (x >= 10) ☐
 - d. (x > 4) || (x < 10) ☐
- 3) The software that controls and manages the computer resources is:
 - a. Linker ☐
 - b. Loader ☐
 - c. Web browser ☐
 - d. Operating system ☐
- 4) The value of **((x - 4) != 4) && ((x - 4) == 4)** is:
 - a. (x - 4) ☐
 - b. False ☐
 - c. (x + 4) ☐
 - d. none of the above ☐
- 5) A Kilobyte is:
 - a. 2^{10} bytes ☐
 - b. 2^{20} bytes ☐
 - c. 2^{30} bytes ☐
 - a. 2^{40} bytes ☐
- 6) Illegally copying software for use on another computer:
 - a. Computer fraud ☐
 - b. Worm ☐
 - c. Virus ☐
 - d. Software piracy ☐
- 7) The **ALU** is the unit of computer responsible of:
 - a. Storing programs and data permanently ☐
 - b. Performing arithmetic and logical operations ☐
 - c. Performing Input/Output operations ☐
 - d. None of the above ☐
- 8) The value of **((x <= y) || True)** is:
 - a. (x > y) ☐
 - b. (x <= y) ☐
 - c. False ☐
 - d. none of the above ☐
- 9) A computer that provides resources to other computers in a network:
 - a. Modem ☐
 - b. Web browser ☐
 - c. Server ☐
 - d. none of the above ☐
- 10) $(110)_{10} + (110)_2$ is equivalent to:
 - a. $(220)_{10}$ ☐
 - b. $(1110100)_2$ ☐
 - c. $(1100)_2$ ☐
 - d. None of the above ☐

Question 2(20 points)

Show the output of each of the following program segments:

<pre>int A[5] = {3, 5, 2, 8, 1}; int T; bool flag; do { flag = false; for (int j = 0; j < 4; j++) If (A[j] > A[j+1]) { T = A[j]; A[j] = A[j+1]; A[j+1] = T; flag = true; } } while (flag); for(int i=0; i<5; i++) cout<<A[i]<<endl;</pre>	
--	--

<pre>void swap (int&, int&); void main() { int a = 53, b = 57, c = 39; do { if (b > a) swap (a, b); if (c > b) swap (b, c); } while ((b > a) (c > b)); cout << "The two required values are:" << endl; cout << setw(6) << a << setw(6) << b << endl; } void swap (int& X, int& Y) { int T = X; X = Y; Y = T; }</pre>	
--	--

<pre>int B[10], n = 45, c = 0; cout << "The equivalent value of " << n << " is "; do { B[c] = n % 2; n = n / 2; c++; } while (n != 0); for (int k = c-1; k >= 0; k--) cout << B[k]; cout << endl;</pre>	
---	--

<pre> void drawLine(char); int func(int); void main () { drawLine('#'); cout << setw(3) << "k" << setw(8) << "func(k)" << endl; drawLine('-'); for (int k=0; k <= 5; k += 2) cout << setw(3) << k << setw(8) << func(k) << endl; drawLine('#'); } int func(int n) { int f = 1; for (int m=2; m <= n; m++) f = m * f; return f; } void drawLine(char ss) { for (int c = 1; c <= 10; c++) cout << ss; cout << endl; } </pre>	
---	--

Question 3 (20 points)

A person's maximum heart rate can be computed as $hMax = 191.5 - (0.007 \times age^2)$ where age is the person's age. The heart rate index (HRI) is an integer defined as the ratio of the heart rate (HR) multiplied by 10 to the maximum heart rate (hMax) is as indication of the person's exercise level. A person's exercise level is evaluated as follows

HRI = 10*HR/hMax	Exercise Level
HRI<0.5	too low
0.5<=HRI<0.6	Warming up
0.6<= HRI< 0.7	Fat burning
0.7<= HRI < 0.8	Endurance training
0.8 <= HRI	High intensity

Draw a flow chart and write a program in C++ to input the age and HR of a person and output his maximum heart rate and the exercise level. **Show your analysis, draw a flowchart, and write down the corresponding program. Enforce validation on the input age which is a positive integer less than 100 and HR which is a positive integer less than 500.**

Write the program using if-else statements

[illegible]

Do one of the following: (1) write the program analysis and draw the flow chart OR (2)

Rewrite the program using switch-case statements

[illegible]

Question 4 (15 points)

Write only the C++ nested-loop to produce the following pattern:

```

                #
              &  &
            @  @  @
          #  #  #  #
        &  &  &  &  &
      @  @  @  @  @  @
    #  #  #  #  #  #  #
  &  &  &  &  &  &  &

```

The Loop

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 5 (15 points)

A Prime number is a positive integer number greater than 1 which is only divisible by itself (and eventually by 1). The first prime number is 2, and the next is 3, and so on. The following C++ program lists all the prime numbers in the range of 2 to 500. There are some missings (represented by dots) in the given program. Complete these missings such that the program could be compiled and run correctly.

The Program

```
#include <iostream>
using namespace std;
..... prime (.....);
void main ()
{
    for (int num = 2; .....; ..... )

        if (.....)

            cout << num << endl;

}

bool prime ( int n)
{
    bool flag = true;
    int c = 2;
    do{
        if (.....)

            .....;

        else

            flag = false;

    }while (.....);

    .....;
}
```

Question 6 (20 points)

Write a program that includes two functions called **min** and **avg**. **min** takes as input three integers and returns the minimum, whereas **avg** takes as input three integers and returns their average (a float). The program should do the following:

- (1) Ask the user how many times to repeat the program (N)
- (2) Repeat step (3) to (5) N times
- (3) Ask the user for three numbers
- (4) Uses the function min to compute the minimum value and the function avg to compute their average
- (5) Print the minimum and average on the screen.

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

Good Luck