

**The American University in Cairo**  
**Computer Science & Engineering Department**  
**CSCE 106**

|                          |                   |                     |
|--------------------------|-------------------|---------------------|
| <b>Instructor:</b>       | <b>Final Exam</b> | <b>Fall 2009</b>    |
| <b>Last Name :</b> ..... |                   | <b>ID:</b> .....    |
| <b>First Name:</b> ..... |                   | <b>Section No.:</b> |

**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        | 25     |       |
| 3        | 15     |       |
| 4        | 15     |       |
| 5        | 15     |       |
| 6        | 20     |       |
| Total    | 100    |       |

### Question 1 (10 points)

Tick only one possible answer for each of the following:

- 1) The value of  $(x - 4 \neq 4) \&\& (x - 4 == 4)$  is:
  - a.  $x - 4$  ☐
  - b. True ☐
  - c.  $x + 4$  ☐
  - d. None of the above ☐
- 2)  $(101000111)_2$  is equivalent to:
  - a.  $(507)_8$  ☐
  - b.  $(507)_{16}$  ☐
  - c.  $(5544)_{10}$  ☐
  - d. None of the above ☐
- 3)  $(-15)_{10}$  in 8-bit two's complement format is:
  - a. 110001 ☐
  - b. 11110000 ☐
  - c. 11110001 ☐
  - d. None of the above ☐
- 4) Von Neumann architecture is:
  - a. A stored-program computer ☐
  - b. A web browser ☐
  - c. An architecture for RAM ☐
  - d. All the above ☐
- 5) The value of  $(10 \% 4 * 3 - 8) >= (18 + 30 / 4 - 20)$  is:
  - a. -2 ☐
  - b. True ☐
  - c. False ☐
  - d. None of the above ☐
- 6) Software Piracy is:
  - a. Violation of copyright agreements by illegally copying software ☐
  - b. Code disrupting the computer operations and erasing information ☐
  - c. A Computer theft or computer fraud ☐
  - d. A biological disease causing malfunctioning of the computer ☐
- 7) The RAM is used to:
  - a. To store fixed code to start up the computer ☐
  - b. To store programs and data that are to be executed ☐
  - c. To perform the arithmetic and logical operations ☐
  - d. none of the above ☐
- 8) In binary:  $1011 + 11011 = ?$ 
  - a. 101000 ☐
  - b. 100110 ☐
  - c. 110110 ☐
  - d. 100101 ☐
- 9) 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 ☐
- 10) The Compiler is a software that:
  - a. translates a high-level language program into machine language ☐
  - b. translates an assembly language program into machine language ☐
  - c. lets users display and view a web document ☐
  - d. None of the above ☐

## Question 2 (25 points)

Show the output of each of the following program segments:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre>Show the output of the following program segment for the following set of data: 6 3 9 0 0 19 int n, i; bool valu; bool cont = true; while (cont) {     cin &gt;&gt; n;     if (n == 0)         cont = false;     else     {         i = 2;         valu = true;         while ((i &lt; n) &amp;&amp; (valu))             if ((n % i) == 0)                 valu = false;             else                 i++;     }     if (valu)         cout &lt;&lt; n &lt;&lt; " is OK " &lt;&lt; endl; }</pre> |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|                                                                                                                                                                                    |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre>int x = 1, y = 1; while (x &lt; 4) {     y = y * x++;     cout &lt;&lt; "x = " &lt;&lt; setw(2) &lt;&lt; x &lt;&lt; "y = " &lt;&lt; setw(2) &lt;&lt; y &lt;&lt; endl; }</pre> |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|                                                                                                                                                                                                                                                                                                                                                                                            |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre>int F[6] = {1, 1}; const int zero = 0; const int one = 1; cout &lt;&lt; setw(3) &lt;&lt; zero &lt;&lt; setw(3) &lt;&lt; F[0] &lt;&lt; endl; cout &lt;&lt; setw(3) &lt;&lt; one &lt;&lt; setw(3) &lt;&lt; F[1] &lt;&lt; endl;  for (int k = 2; k &lt; 6; k++) {     F[k] = F[k-1] + F[k-2];     cout &lt;&lt; setw(3) &lt;&lt; k &lt;&lt; setw(3) &lt;&lt; F[k] &lt;&lt; endl; }</pre> |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

```

int BB[4];
const int two = 2;
int n = 13;
int c = 3;
int nn = n;
do
{
    BB[c] = nn % two;
    n /= two;
    c--;
} while (nn != 0);
cout << "The equivalent value of " << n << " is ";
for (int k = 0; k < 4; k++)
    cout << BB[k];
cout << endl;

```

```

int nm;
const int one  = 1;
const int two  = 2;
const int three = 3;

for ( int n = 1; n < 10; n++)
{
    switch(n % three)
    {
        case 1:
            nm = one;
            break;
        case 2:
            nm = two;
            break;
        default:
            nm = three;
    }
    for (int m = 1; m <= n; m++)
        cout << nm;
    cout << endl;
}

```

```

int myfact(int n);
void main ()
{
    int s = 0;
    for (int k=0; k <= 4; k++)
        s += myfact(k);
}

int myfact(int n)
{
    int f = 1;
    for (int m=2; m <= n; m++)
        f *= m;
    return f;
}

```

### Question 3 (15 points)

Write a C++ program that uses **only two nested loops** to produce the following output:

@  
&&  
&&&  
@@@  
@@@@  
&&&&&&  
&&&&&&&  
@@@@@@@@  
@@@@@@@@@  
&&&&&&&&&&&  
&&&&&&&&&&&&  
@@@@@@@@@@@@@

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.

### Question 4 (15 points)

Write a program in C++ to enter 24 readings of temperature in a day, compute the average temperature, and count the number of readings that are greater than the average. Print the average temperature and the count with appropriate format. Add the necessary validation such that the program accept only temperature value between -5 and 42.

This image shows a full page of a document template designed for handwriting practice. It features approximately 30 evenly spaced, horizontal dashed lines across the entire width of the page. The background is plain white, and there are no margins, headers, or footers present.

### **Question 5 (15 points)**

If the sum of digits of any positive integer number is divisible by 9, the number itself is also divisible by 9. For example, the number 459 is divisible by 9 because the sum of its digits 4, 5, and 9 is equal to 18 which is divisible by 9. Also, the number 29961 is divisible by 9 because the sum of its digits 2, 9, 9, 6, 1 is 27 which is divisible by 9, while, the number 7628 is not divisible by 9 because the sum of its digits 7, 6, 2, and 8 is 23 which is not divisible by 9.

The following C++ program takes a positive integer number greater than 99 and less than 88888 and checks whether it is divisible by 9 or not, using the above mentioned technique. 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>
#include <iomanip>
using namespace std;

void main ()
{
    int num, d, sum;
    .....;

    do
    {
        cout << "Enter a positive integer number greater than 99 and less than 88888" << endl;
        cin >> num;
    } while (.....);

    nn = num;
    while ( nn != 0 )
    {
        d = .....;

        sum = sum + d;

        nn = .....;
    }

    if (.....)
        cout << "The number " << setw(6) << num << " is divisible by 9" << endl;
    else
        cout << "The number " << setw(6) << num << " is NOT divisible by 9" << endl;
}
```

### Question 6 (20 points)

**Solve only (A) or (B)**

**(A)**

A perfect number is a positive integer having the property that the sum of its factors (including 1) equal to the number itself. The first perfect number is 6 because its factors are 1, 2 and 3 and their sum is 6 which is equal to the number itself. The next perfect number is 28 because its factors are 1, 2, 4, 7 and 14 and their sum is 28 which is equal to the number itself. Write a **modular** C++ program that prints a list of all the perfect numbers in the range of 100 to 1000.

(Hint: Define a function **perfect** that takes a number to check it and return an appropriate output indicating the case).

**(B)**

Draw a Flowchart then write a program in C++ to process data sets of 40 students. A data set of each student consists of the student Id (a long integer) and five test scores (only integer values between 0 and 100, inclusive). The program reads a data set of each student and writes out the student Id and the average of the five scores in a tabular form. Print the Student ID of a student having the worst average and the average score of the class .A sample of the output is as follows:

| Student ID | Student Average |
|------------|-----------------|
| 1345678    | 90.54           |
| 1345679    | 84.67           |
| 1345680    | 92.87           |
| 1345681    | 78.90           |

**Your are asked to design a flowchart for the program . Implement a function that reads the five scores of a student and returns the average score to the main function.**

[illegible]

**Good Luck**