Computer Sciences – 16/02/2018 – **Duration: 2h**

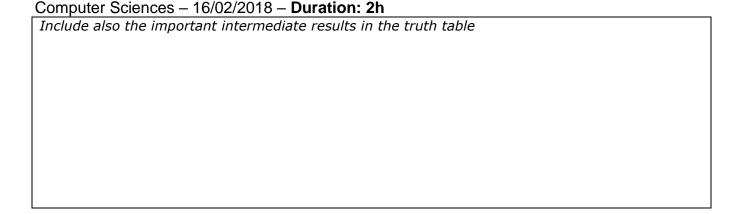| SURNAME:		NAME		**C1**
STUDENT ID:				
PROFESSOR:				

Question 1	Answer

Given the following 8-bit numbers, calculate the sum of them first consider them as Two's Compliment (2C), then as Sign and Magnitude (SM). Report the answers as decimal numbers (DEC) and if there is or not overflow (OV).
 	
a. 10010101 + 10110011
b. 01010101 + 00100101
	a: 2C_____ DEC_____
	   OV_____
	
	b: SM_____ DEC_____
	   OV_____

Important steps for getting the answer	

Question 2	Function	*Output*

Write the output of the following fragment of code	```int fun(int n1, int *n2, int n3[])
	{
	    int a;
	    a=n1+*n2;
	    n1++;
	    (*n2)--;
	    n3[0]++;
	    n3[1]--;
	    return a;
	}```	

Main (fragment)		
```int a=0,b=0,c[2]={0}; printf("%d\n%d\n%d\n%d", a, b, c[0], fun(a,&b,c));```		

Question 3
Write the truth table of the following Boolean function. f=A'(B+A)+A(BA+A'A')

Include also the important intermediate results in the truth table

Question 4 (PRORAMMING)

Samuel Pickwick came into possession of a text file containing a map, called **bath.txt**. The file represents the area surrounding the city of Bath in matrix form, and could indicate the hiding place of ancient artifacts. The symbol 'S' represents the station. The symbol 'X' represents a generic area. The map contains **M** paths. Each path starts with the number identifying the path (ID of the path) and continues in one of the 4 directions (north, south, east, west) marked with symbol '+'. The paths never touch or cross each other.

Mr. Pickwick needs a software to calculate the length of the map paths.
Write a C program that reads the **bath.txt** file, and prints on screen the length of a path, whose ID is passed as the only command line argument. The program also needs to print on the screen the average length of all paths in the map.
The number of paths is **M**, while the map is a square of **NxN**. **M** and **N** are defined using #define, **M** between 1 and 9, N between 10 and 100.
The file **bath.txt** is always correct.

Example with M=4 and N=11

bath.txt
```
XXXXXSXXX4X
XXX1XXX2X+X
XXX+XXX+X+X
XXX+X+X+X+X
XXX+X+X+XXX
XXX+++X+XXX
XXXXXXX+XXX
XXXXX+++XXX
XXXXXXXXXXX
+++3XXXXXXX
XXXXXXXXXX
```

Excution result:
```
C:\>path.exe 3
The path 3 is 4 units long.
The average of all paths is 6.50 units.
```

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SURNAME:		NAME		**C2**
STUDENT ID:				
PROFESSOR:				

Question 1	*Answer*
Given the following 8-bit numbers, calculate the sum of them first consider them as Two's Compliment (2C), then as Sign and Magnitude (SM). Report the answers as decimal numbers (DEC) and if there is or not overflow (OV). a. 10011001 + 10110011 b. 01010101 + 00110101	a: 2C_____ DEC_____ OV_____ b: 2C_____ DEC_____ OV_____
Important steps for getting the answer	

Question 2	Function	*Output*
Write the output of the following fragment of code	```int fun(int *n1, int n2, int n3[]) { int a; a=*n1+n2; (*n1)++; n2--; n3[0]++; n3[1]--; return a; }```	
Main (fragment)		
```int a=1,b=1,c[2]={1}; printf("%d\n%d\n%d\n%d", a, b, c[1], fun(&a,b,c));```		

Question 3
Write the truth table of the following Boolean function.   f=A'(B+A)+A'(B+A+A'A')
Include also the important intermediate results in the truth table

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Question 4 (PRORAMMING)

Samuel Pickwick came into possession of a text file containing a map, called **bath.txt**. The file represents the area surrounding the city of Bath in matrix form, and could indicate the hiding place of ancient artifacts. The symbol 'S' represents the station. The symbol 'V' represents a generic area. The map contains **M** paths. Each path starts with the number identifying the path (ID of the path) and continues in one of the 4 directions (north, south, east, west) marked with symbol '+'. The paths never touch or cross each other.

Mr. Pickwick needs a software to calculate the length of the paths.
Write a C program that reads the **bath.txt** file, and prints on screen the length of a path, whose ID is passed as the only command line argument. The program also needs to print on the screen the total length of all paths in the map.
The number of paths is **M**, while the map is a square of **NxN**. **M** and **N** are defined using #define, **M** between 1 and 9, N between 10 and 100.
The file **bath.txt** is always correct.

Example with M=4 and N=11

bath.txt
```
VVVVVSVVV4V
VVV1VVV2V+V
VVV+VVV+V+V
VVV+V+V+V+V
VVV+V+V+VVV
VVV+++V+VVV
VVVVVVV+VVV
VVVVV+++VVV
VVVVVVVVVVV
+++3VVVVVVV
VVVVVVVVVVV
```

Excution result:
```
C:\>path.exe 3
The path 3 is 4 units long.
The number of units of all paths is 26.
```