PROJECT 1

PART I - HLL
PART II - AL

CSCI 150
ASSEMLY LANGUAGE

MAI PHAM

DEVELOPMENT ENVIRONMENT
VISUAL STUDIO 2012

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PROJECT NOTE

OBJECTIVE:

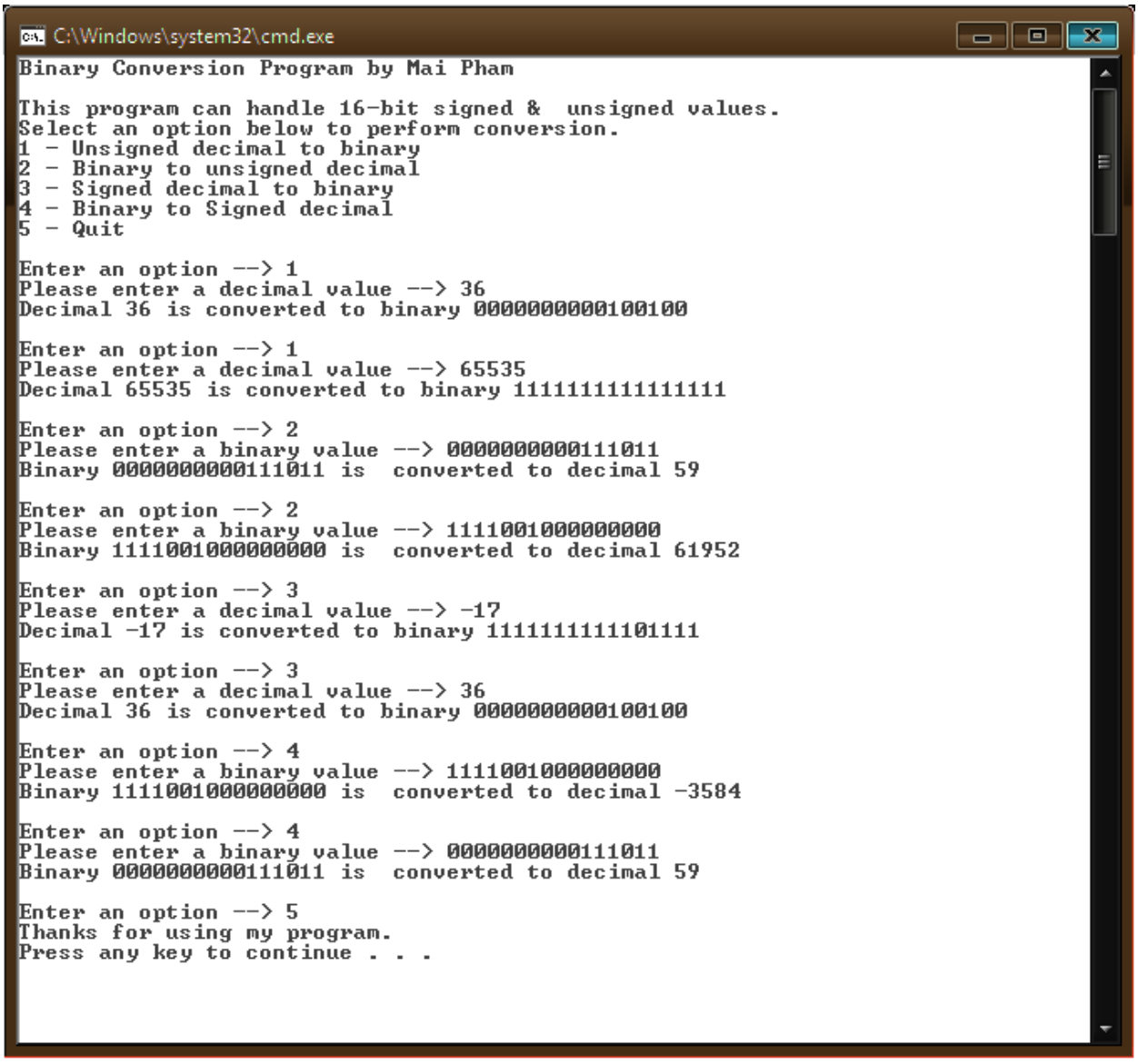
- Part A: Write a conversion program for 16 bit signed and unsigned decimal to binary and vice versa.
- Part B: Write an assembly program that implements two arithmetic expressions

SUMMARY/EXTRA CREDIT:

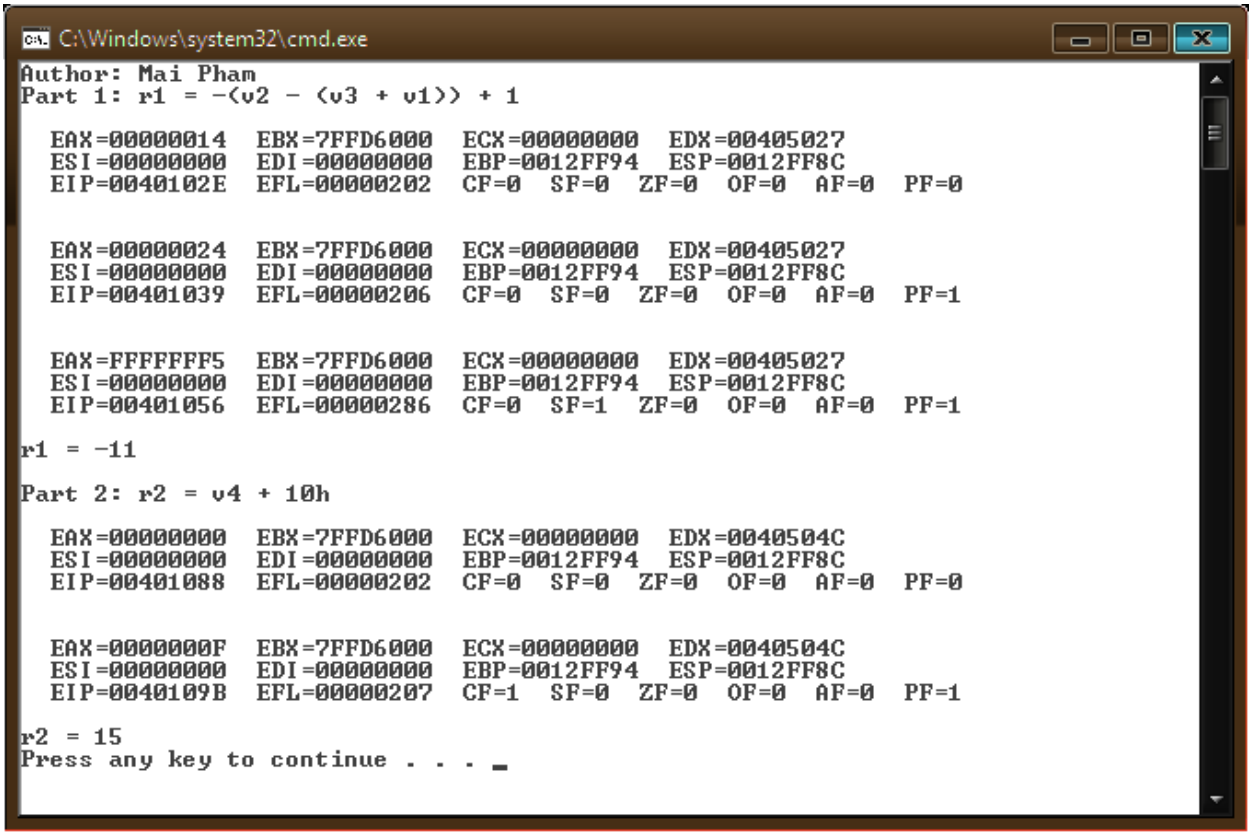
- I didn't encounter much problems with Part A and Part B since the Lab 1 to 3 does help with most of the coding, including for the extra credit 1 and 2. Overall, my project is completed and successfully run both parts of the project and the extra credits.

OUTPUT

PART I - HLL



PART II - AL



SOURCE CODE

PART I – HLL

```
#include <iostream>
#include <string>
using namespace std;

string decToBinary (int dec);
int binary2Decimal(string b);
void addOne(string &b);
void flipBinary(string &b);

int main()
{
	/*	TESTING
	string a = "0";
	a[0]++;
	cout << a << endl;			// output: 1
	string b = "1";
	b[0]++;
	cout << b << endl;			// output: 2
	int dec = -45;
	cout << dec*-1 << endl;			// output: 45
	*/

	int option;
	string binary;
```

```
	int decimal;

	cout << "Binary Conversion Program by Mai Pham\n\n";
	cout << "This program can handle 16-bit signed &  unsigned values.\n";
	cout << "Select an option below to perform conversion.\n";
	cout << "1 - Unsigned decimal to binary\n";
	cout << "2 - Binary to unsigned decimal\n";
	cout << "3 - Signed decimal to binary\n";
	cout << "4 - Binary to Signed decimal\n";
	cout << "5 - Quit\n\n";

	cout << "Enter an option --> ";
	cin >> option;
	while (option > 0 && option < 5)
	{
		if (option == 1)	{
			cout << "Please enter a decimal value --> ";
			cin >> decimal;
			cout << "Decimal " << decimal << " is converted to binary " <<
decToBinary (decimal) << endl;
		}
		if (option == 2)	{
			cout << "Please enter a binary value --> ";
			cin >> binary;
			cout << "Binary " << binary << " is " << " converted to decimal "
<<binary2Decimal(binary) << endl;
		}
		if (option == 3)	{
			cout << "Please enter a decimal value --> ";
			cin >> decimal;
			if (decimal >= 0)
				binary = decToBinary (decimal);
			if (decimal < 0)	{
				binary = decToBinary ((decimal*-1));
				flipBinary(binary);
				addOne(binary);
			}
			cout << "Decimal " << decimal << " is converted to binary " <<
binary << endl;
		}
		if (option == 4)	{
			cout << "Please enter a binary value --> ";
			cin >> binary;
			if (binary[0] == '0')
				cout << "Binary " << binary << " is " << " converted to
decimal " <<binary2Decimal(binary) << endl;
			else if (binary[0] == '1')  {
				string tempBinary;
				tempBinary = binary;
				flipBinary(tempBinary);
				addOne(tempBinary);
				cout << "Binary " << binary << " is " << " converted to
decimal " << (0-binary2Decimal(tempBinary)) << endl;
			}
		}

		cout << "\nEnter an option --> ";
		cin >> option;
	}
```

```
	cout << "Thanks for using my program.\n";
	return 0;
}

string decToBinary (int dec)    {
    string binary = " ";
    char c;
    while (dec != 0)    {
        c = '0' + dec % 2;
        binary = c + binary;
        dec/=2;
    }
    while (binary.length() <= 16)    {
        binary = "0" + binary;
    }

    return binary;
}

void flipBinary(string &b)  {
	for (int i = 0; i < 16; i++)
		if (b[i] == '0')
			b[i] = '1';
		else
			b[i] = '0';
}

void addOne(string &b)      {
	int remainder = 0;
	int i = 15;

	b[i]++;
	while (b[i] == '2')  {
		remainder = 1;
		b[i] = 0;
		i--;
		b[i] += remainder;
	}
}

int binary2Decimal(string b)       {
	int decimal = 0;
	int j = 0;
	for (int i = 15; i >= 0; i--)      {
		if (b[i] == '1')
			decimal += pow(2,j);
		j++;
	}
	return decimal;
}
```

PART II - AL

```
TITLE ASM Template                              (template.asm)
INCLUDE Irvine32.inc

.data
v1      SDWORD 10h
v2      SDWORD 30h
v3      SDWORD 20
```

```
r1      SDWORD ?
v4      WORD   0FFFFh
r2      WORD   ?
author BYTE    "Author: Mai Pham", 0Dh, 0AH, 0
p1             BYTE   "Part 1: r1 = -(v2 - (v3 + v1)) + 1", 0Dh, 0AH, 0
p2             BYTE   "Part 2: r2 = v4 + 10h", 0Dh, 0AH, 0
ans1   BYTE    "r1 = ", 0
ans2   BYTE    "r2 = ", 0

.code

main PROC
       mov    edx, OFFSET author   ; display name
       call WriteString            ; display a null-terminated string.

       mov    edx, OFFSET p1       ; display part 1
       call WriteString            ; display a null-terminated string.

       ;r1 = -(v2 - (v3 + v1)) + 1
       mov    eax, v3              ; eax = 14h (20d)
       call DumpRegs               ; display the registers

       add    eax, v1              ; 14h add 10h (20d + 16d), eax = 24h (36d)
       call DumpRegs               ; display the registers

       sub    v2, eax              ; 30h - 24h (48d - 36d), v2 = Ch (12d)
       neg v2                      ; v2 = FFF4h (-12d)
       add v2, 1                   ; v2 = FFF5h (-11d)
       mov eax, v2                 ; eax = FFF5h
       call DumpRegs               ; display the registers
       mov r1, eax

       mov edx, OFFSET ans1 ; display answer r1
       call WriteString
       call WriteInt               ; 32 bit signed number
       call crlf                   ; enter
       call crlf                   ; enter

       ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

       mov    edx, OFFSET p2       ; display name
       call WriteString            ; display a null-terminated string.

       ;r2 = v4 + 10h
       mov eax, 0                  ; clear eax
       call DumpRegs

       add    v4, 10h              ; 0FFFFh add 10h (65535d + 16d), v4 = 1000Fh (65551d)
       mov    ax, v4               ; ax = 000Fh (15d)
       call DumpRegs
       mov r2, ax                  ; r2 = 000Fh (15d)

       mov edx, OFFSET ans2 ; display answer r2
       call WriteString
       call WriteDec               ; 32 bit unsigned number
       call crlf

    exit
main ENDP
END main
```