Laboratory Exercise #5

Reading

- Read Section 4.6 until 4.8 of Paul Carter's PC Assembly Book

Practice Exercise:

- Assemble the assembly code (**max.asm)**. This will create an object file (**max.o**) for max.asm.

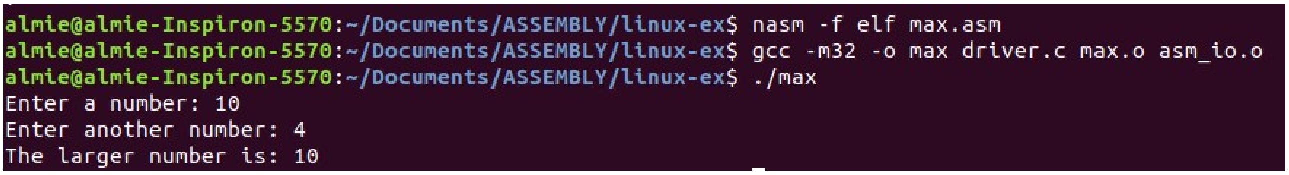
```
   nasm -f elf max.asm
```

- Compile and link the assembly code with the C program (**driver.c**). In our machine, we will be using 32-bit registers thus we specify “-m32”.

```
   gcc -m32 -o max driver.c max.o asm_io
```

- Execute the assembly code.

```
   ./max
```



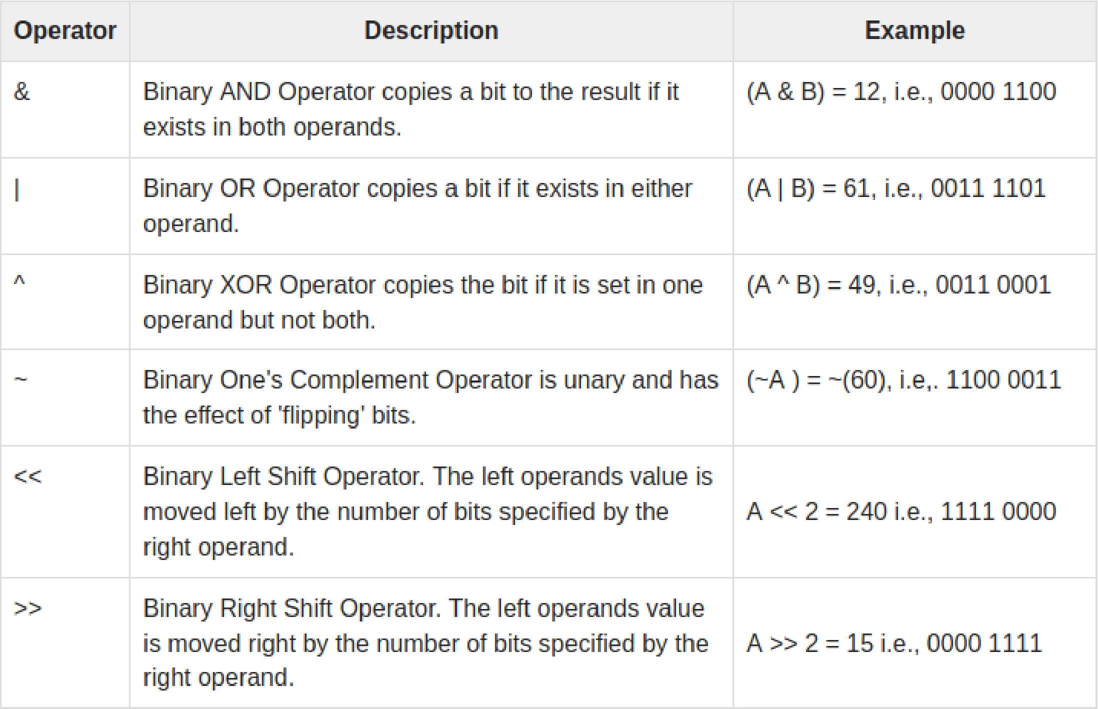
```
almie@almie-Inspiron-5570:~/Documents/ASSEMBLY/linux-ex$ nasm -f elf max.asm
almie@almie-Inspiron-5570:~/Documents/ASSEMBLY/linux-ex$ gcc -m32 -o max driver.c max.o asm_io.o
almie@almie-Inspiron-5570:~/Documents/ASSEMBLY/linux-ex$ ./max
Enter a number: 10
Enter another number: 4
The larger number is: 10
```

- Analyze the sample code (max.asm). Reflective questions:

```
   What does the max.asm do? How does “OR”, “AND” , “XOR”, “NOT”
instruction works?
```

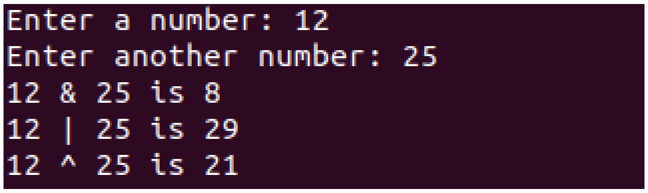
Problem #5.

- Write an assembly program that implements the Bitwise OR, AND, and XOR operations.



Operator	Description	Example
&	Binary AND Operator copies a bit to the result if it exists in both operands.	(A & B) = 12, i.e., 0000 1100
|	Binary OR Operator copies a bit if it exists in either operand.	(A | B) = 61, i.e., 0011 1101
^	Binary XOR Operator copies the bit if it is set in one operand but not both.	(A ^ B) = 49, i.e., 0011 0001
~	Binary One's Complement Operator is unary and has the effect of 'flipping' bits.	(~A) = ~(60), i.e,. 1100 0011
<<	Binary Left Shift Operator. The left operands value is moved left by the number of bits specified by the right operand.	A << 2 = 240 i.e., 1111 0000
>>	Binary Right Shift Operator. The left operands value is moved right by the number of bits specified by the right operand.	A >> 2 = 15 i.e., 0000 1111

- Use Bitwise assembly operations to solve the problem.
- The output of your program is something like this:



```
Enter a number: 12
Enter another number: 25
12 & 25 is 8
12 | 25 is 29
12 ^ 25 is 21
```

- A good programming practice is to write comments on important line of codes for readability and documentation.
- Save your program in a file called surname_lab5.asm. For instance if your surname is “Dela Cruz”, submit it as follows:

```
    delacruz_lab5.asm
```

Note: Take a screen record of your working code and make sure to record a video explaining each line of your code as well as showing the correct output of your code. Use screen recorder application in Ubuntu (https://itsfoss.com/best-linux-screen-recorders/) or Windows (https://atomisystems.com/screencasting/record-screen-windows-10/)

Deadline :_______________________________________

Rubric for Programming Exercises

Program (50 pts)	**Excellent**	**Good**	**Fair**	**Poor**
Program Execution	Program executes correctly with no syntax or runtime errors (9-10)	Program executes with minor (easily fixed) error (4-8)	Program executes with a major (not easily fixed) error (2-3)	Program does not execute (0-1)
Correct Output	Program displays correct output with no errors (9-10)	Output has minor errors (6-8)	Output has multiple errors (3-5)	Output is incorrect (0-2)
Design of Output	Program displays more than expected (7-8)	Program displays minimally expected output (5-6)	Program does not display the required output (3-4)	Output is poorly designed (0-2)
Design of Logic	Program is logically well-designed (9-10)	Program has slight logic errors that do not significantly affect the results (6-8)	Program has significant logic errors (3-5)	Program is incorrect (0-2)
Standards	Program is stylistically well designed (6-7)	Few inappropriate design choices (i.e., poor variable names, improper indentation) (4-5)	Several inappropriate design choices (i.e., poor variable names, improper indentation) (2-3)	Program is poorly written (0-1)
Documentation	Program is well-documented (5)	Missing one required comment (4)	Missing two or more required comments (2-3)	Most or all documentation missing (0-1)