



DESIGN AND IMPLEMENTATION OF AN ALU

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INTRODUCTION

This project aims to design an ALU using NEXYS 2 FPGA board. The arithmetic and logic unit (ALU) is a digital circuit that performs integer arithmetic and logical operations. FPGA Field programmable gates array is a chip that can be reprogrammed according to the users demand. The FPGA consist of thousands of logic gates and RAM's integrated together. FPGA can be programmed to be a processor, micro-controller, memory etc. FPGA can be programmed using VHDL (Very High Speed Integrated Circuit Hardware Description Language) or Verilog. This design can be used as a calculator.

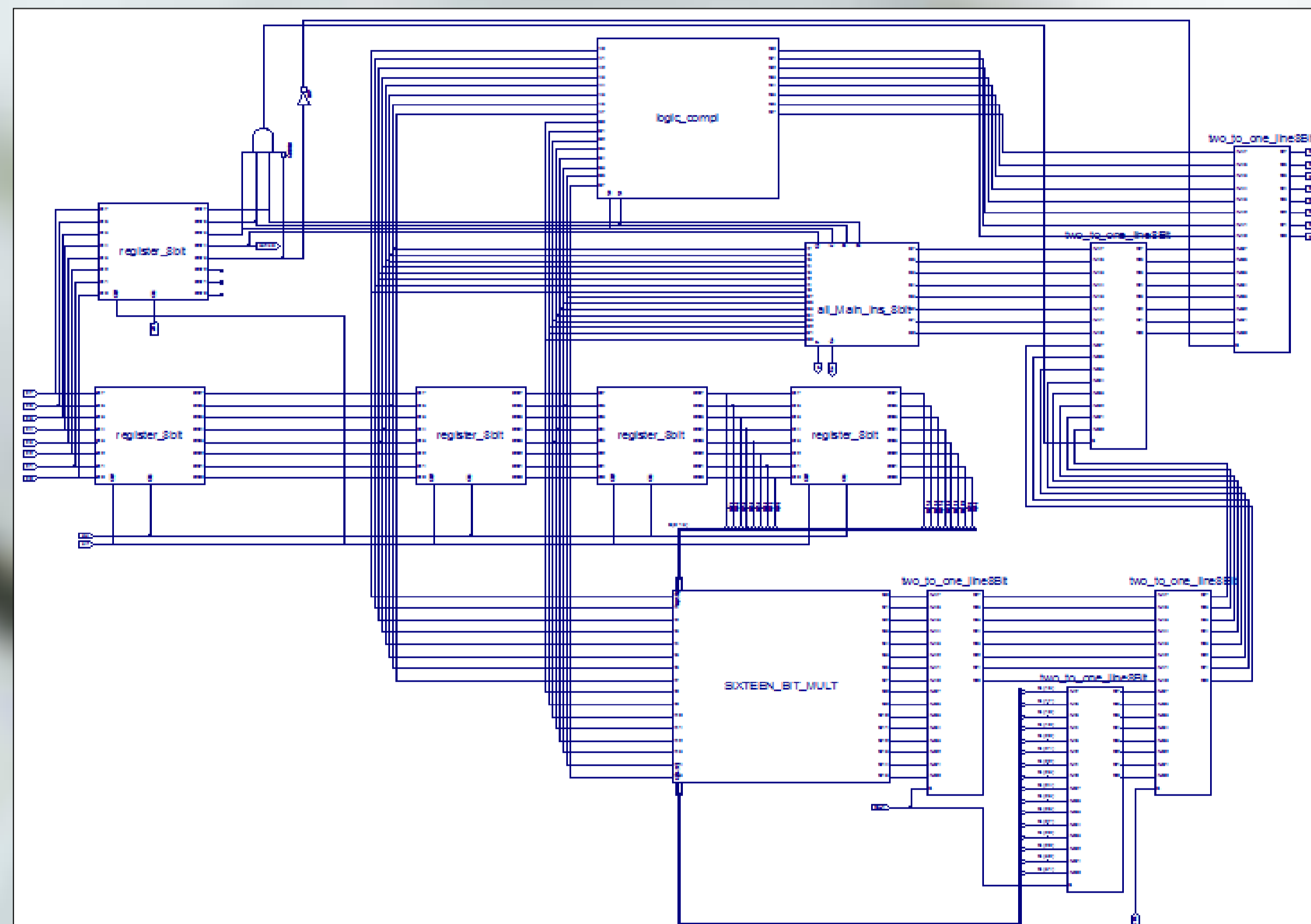
OBJECTIVES

The main objective of this project is to design and implement an ALU that performs:

- ❖ Arithmetic operations.
- ❖ Logic operations.
- ❖ Trigonometric operations.

BLOCK DESIGN USING ISE DESIGN SUITE 14.2

THE FULL DESIGN CIRCUIT



NEXYS 2 FPGA



OPERATIONS DONE

Instruction name	Symbol	Instruction name	Symbol
Addition	ADD	NOT	NOT
Addition with carry	ADC	XOR	XOR
Subtraction	SUB	Multiplication	MUL
Subtraction with borrow	SBB	Factorial	FACTORIAL
Increment	INC	Square	SQUARE
Decrement	DEC	Cube	CUBE
AND	AND	Sin	SIN
OR	OR	Cos	COS

TESTS AND RESULTS

Enter the first value:50.25
 Enter the second value:9.45
 Enter the operation symbol:ADD
 The result = 59.70
 Carry = 0
 Overflow = 0

Enter the first value:10.25
 Enter the second value:15.60
 Enter the operation symbol:AND
 The result = 10.00
 Carry = 0
 Overflow = 0

Enter the first value:5.00
 Enter the second value:0.00
 Enter the operation symbol:FACTORIAL
 The result = 120.00
 Carry = 0
 Overflow = 0

Enter the first value:0.79
 Enter the second value:0.00
 Enter the operation symbol:SIN
 The result = 0.71
 Carry = 1
 Overflow = 0

FUTURE WORK

- ❖ In the future we can increase the number of the logical operations such as XNOR, NAND and NOR.
- ❖ We can improve all the logical operations that we did to any number of bits such as 16 bits or 18 bits.