

Computer Architecture

Realization of Boolean functions.

Objective:

In this lab students will learn about Boolean functions and their implementation from programmatical approach.

Theory:

Truth table for each Boolean logic are as follows:

AND			OR			NOT					
Input		Output	Input		Output	Input	Output				
A	B	Y	A	B	Y	A	Y				
0	0	0	0	0	0	0	1				
0	1	0	0	1	1	1	0				
0	1	0	0	1	1						
1	1	1	1	1	1						
NAND			NOR			X-OR		X-NOR			
Input		Output	Input		Output	Input		Output	Input	Output	
A	B	Y	A	B	Y	A	B	Y	A	B	Y
0	0	1	0	0	1	0	0	0	0	0	1
0	1	1	0	1	0	0	1	1	0	1	0
1	0	1	1	0	0	1	0	1	1	0	0
1	1	0	1	1	0	1	1	0	1	1	1

Exercises:

1. Write a function to implement AND logic.
2. Write a function to implement OR logic.
3. Write a function to implement NOT logic.
4. Write a function to implement NAND logic.
5. Write a function to implement NOR logic.
6. Write a function to implement X-OR logic.
7. Write a function to implement X-NOR logic.

DO MORE:

1. Implement Multiplexer/Demultiplexer logic.
2. Implement Encoder/Decoder logic.

Computer Architecture

Binary addition and subtraction.

Objective:

In this lab students will illustrate the concept of binary addition and subtraction from programmatical approach.

Theory:Addition:

1. X-OR logic is used for addition operation of binary numbers.
2. Half adder is one which adds only two bits.
3. Full adder is one which adds two bits with a carry bit.
4. Full adder logic is used to add the numbers in decimal, additional carry is recorded and converted back to decimal using 2^i logic.

Subtraction:

1. X-OR logic is used with 2's complement of subtrahend.
2. Rest of process is same as in addition operation.

Exercise:Task:

1. Write a function to convert decimal number into binary bits stored in an array.
2. Write a function to convert binary bits stored in an array back to decimal number.
3. Write a function to add two arrays.
4. Write a function to toggle the bits stored into array.

Program:

1. Write a function to add two numbers from user in decimal.
2. Write a program to subtract two numbers from user in decimal.

Procedure:

1. Input two numbers from user.
2. Convert them to binary.
3. For addition:
 - Perform addition between two binary numbers using X-OR logic.
- For subtraction:
 - Calculate 2's complement of subtrahend.
 - Perform addition between minuend and subtrahend.
4. Convert the results into decimal form.
5. Display result in decimal form.