Digital Systems : LAB 2

Nimitt

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Question 1

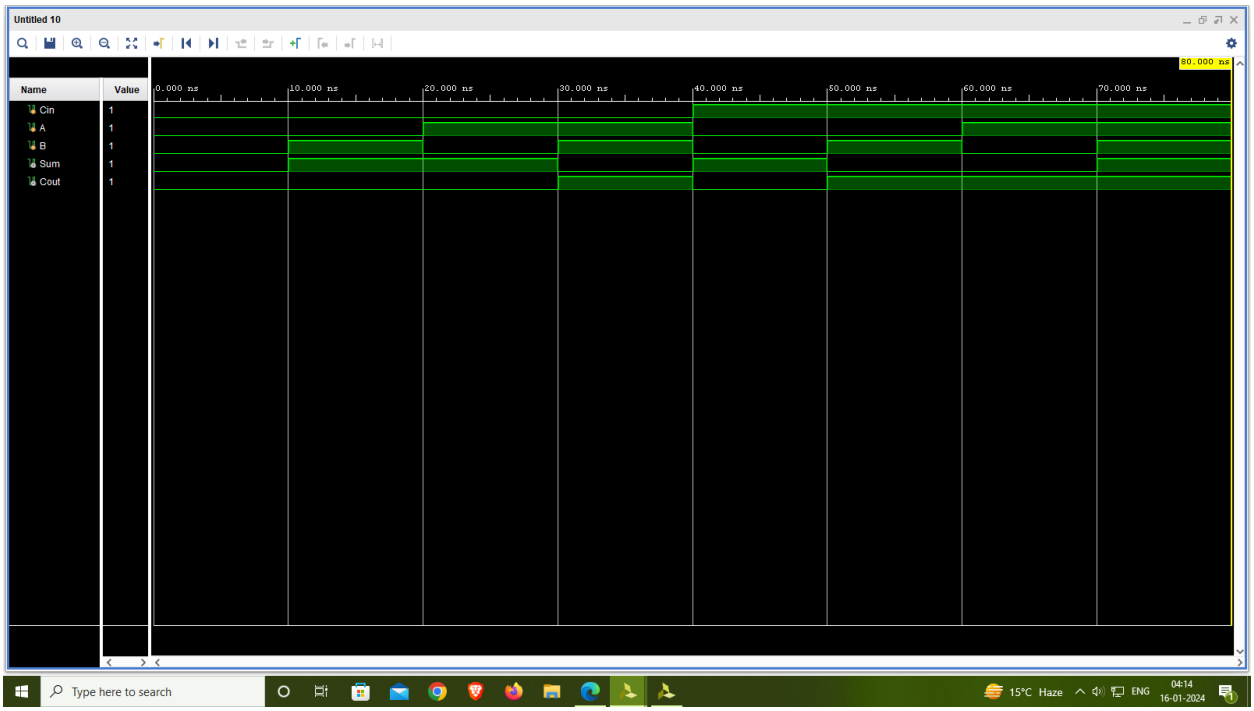
```
/// Full Adder Strucutral Code
`timescale 1ns / 1ps
//////////////////////////////////////////////////////////////////////////////////
// Company:
// Engineer:
//
// Create Date: 16.01.2024 03:09:56
// Design Name:
// Module Name: question1
// Project Name:
// Target Devices:
// Tool Versions:
// Description:
//
// Dependencies:
//
// Revision:
// Revision 0.01 - File Created
// Additional Comments:
//
//////////////////////////////////////////////////////////////////////////////////


module question1(
    input Cin,
    input A,
    input B,
    output Cout,
```

```
    output Sum
    );

    and a1(f, Cin,A);
    and a2(g, A, B);
    and a3(h, B, Cin);
    or a4(Cout, f, g, h);

    xor a5(i, A, B);
    xor a6(Sum,i,Cin);

endmodule
```

```
// TestBench
`timescale 1ns / 1ps
//////////////////////////////////////////////////////////////////////////////////
// Company:
// Engineer:
//
// Create Date: 16.01.2024 03:13:26
// Design Name:
// Module Name: question1_tb
// Project Name:
// Target Devices:
// Tool Versions:
// Description:
//
// Dependencies:
//
// Revision:
// Revision 0.01 - File Created
// Additional Comments:
//
//////////////////////////////////////////////////////////////////////////////////
```

```
module question1_tb();
    reg Cin, A, B;
    wire Sum, Cout;
    question1 uut(Cin, A, B, Cout, Sum);
    initial
    begin
    Cin = 0; A = 0; B = 0;
    #10
    Cin = 0; A = 0; B = 1;
    #10
    Cin = 0; A = 1; B = 0;
    #10
    Cin = 0; A = 1; B = 1;
    #10
    Cin = 1; A = 0; B = 0;
    #10
    Cin = 1; A = 0; B = 1;
    #10
    Cin = 1; A = 1; B = 0;
    #10
    Cin = 1; A = 1; B = 1;
    #10
    $finish();
    end
endmodule
```

Simulations Results :



Question 2 :

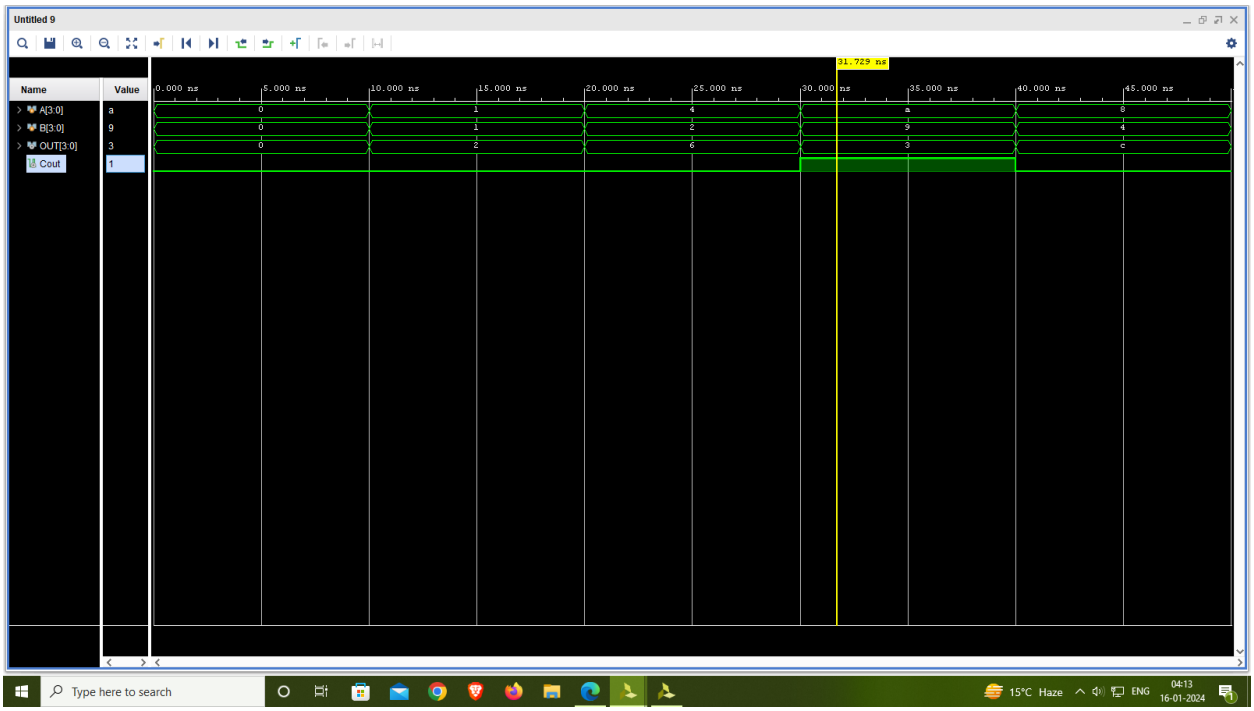
```
/// 4 bit Adder
`timescale 1ns / 1ps
//////////////////////////////////////////////////////////////////////////////////
// Company:
// Engineer:
//
// Create Date: 16.01.2024 03:38:37
// Design Name:
// Module Name: question2
// Project Name:
// Target Devices:
// Tool Versions:
// Description:
//
// Dependencies:
```

```
//
// Revision:
// Revision 0.01 - File Created
// Additional Comments:
//
//////////////////////////////////////////////////////////////////


module question2(
    input [3:0] A,
    input [3:0] B,
    output [3:0] OUT,
    output Cout
    );
    wire w1, w2, w3;
    question1 inst1 (.Cin(0), .A(A[0]),.B(B[0]), .Cout(w1),.Sum
    question1 inst2 (.Cin(w1), .A(A[1]), .B(B[1]), .Cout(w2), .S
    question1 inst3 (.Cin(w2), .A(A[2]), .B(B[2]), .Cout(w3), .S
    question1 inst4 (.Cin(w3), .A(A[3]), .B(B[3]), .Cout(Cout),

endmodule
```

```
// TestBench
`timescale 1ns / 1ps
//////////////////////////////////////////////////////////////////
// Company:
// Engineer:
//
// Create Date: 16.01.2024 03:56:46
// Design Name:
// Module Name: Question2_tb
// Project Name:
// Target Devices:
// Tool Versions:
// Description:
```

```
//
// Dependencies:
//
// Revision:
// Revision 0.01 - File Created
// Additional Comments:
//
//////////////////////////////////////////////////////////////////


module Question2_tb();
    reg [3:0] A;
    reg [3:0] B;
    wire [3:0] OUT;
    wire Cout;

    question2 uut(A , B, OUT, Cout);
    initial
    begin
        A = 4'b0000; B = 4'b0000;
        #10;
        A = 4'b0001; B = 4'b0001;
        #10;
        A = 4'b0100; B = 4'b0010;
        #10;
        A = 4'b1010; B = 4'b1001;
        #10;
        A = 4'b1000; B = 4'b0100;
        #10;
    $finish();
    end
endmodule
```

Simulation Results :


Untitled 9
31.729 ns
Name
Value
A[3:0]
a
B[3:0]
9
OUT[3:0]
3
Cout
1
0.000 ns
5.000 ns
10.000 ns
15.000 ns
20.000 ns
25.000 ns
30.000 ns
35.000 ns
40.000 ns
45.000 ns
Type here to search
15°C Haze
ENG
04:13
16-01-2024