Experiment-3 : BCD to Binary Converter

Objective:

To design a BCD to binary converter and write a simple test bench for it. The test bench should generate stimulus to completely verify the functionality of the design.

Tool Used:

Xilinx ISE.

Theory:

The value of 2nd digit is multiplied with 10 and added to the lower bit.

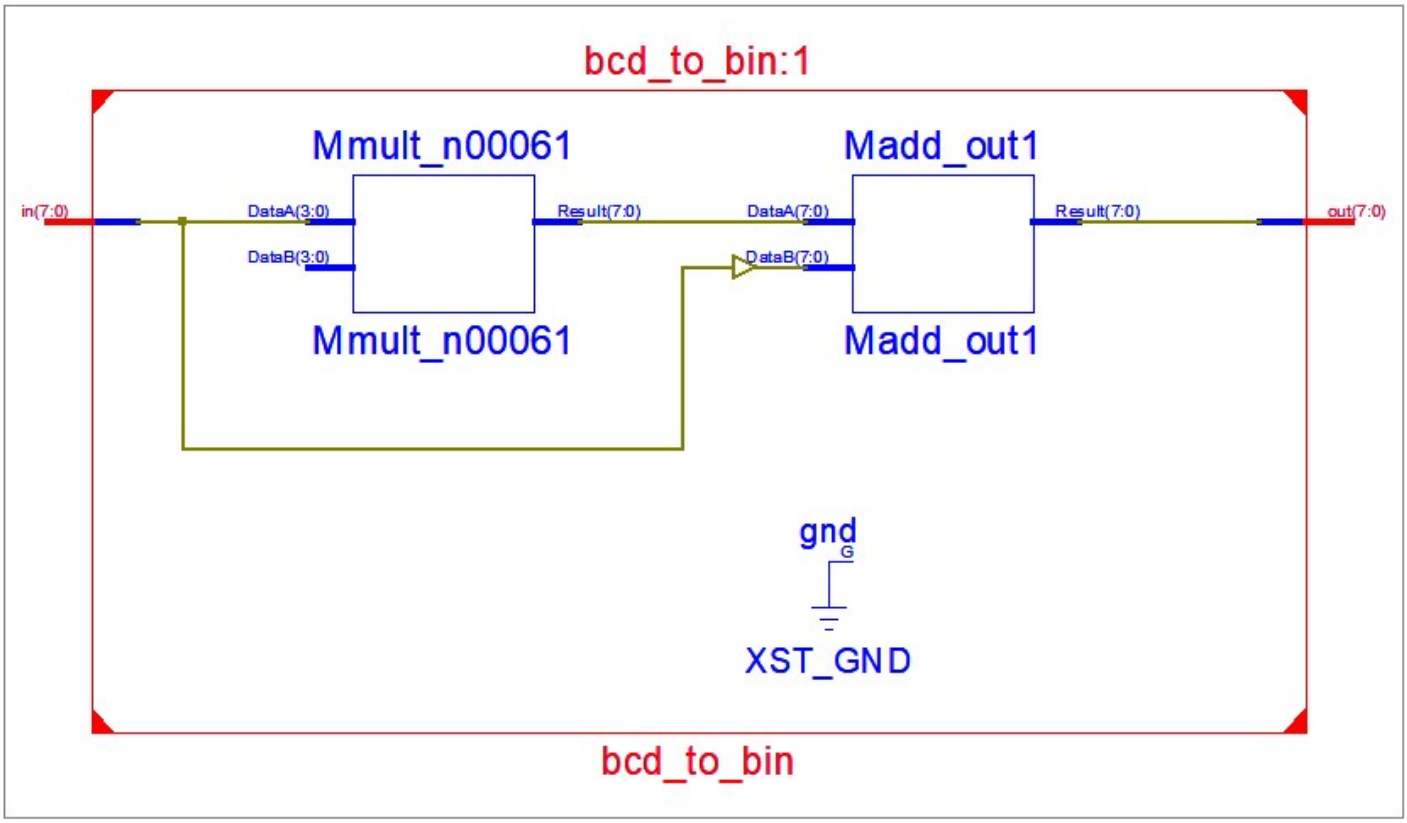
DUT Code:

```
module bcd_to_bin(input [7:0]in, output [7:0]out);
    assign out = in[7:4]*10 + in[3:0]; //logic for conversion
endmodule
```

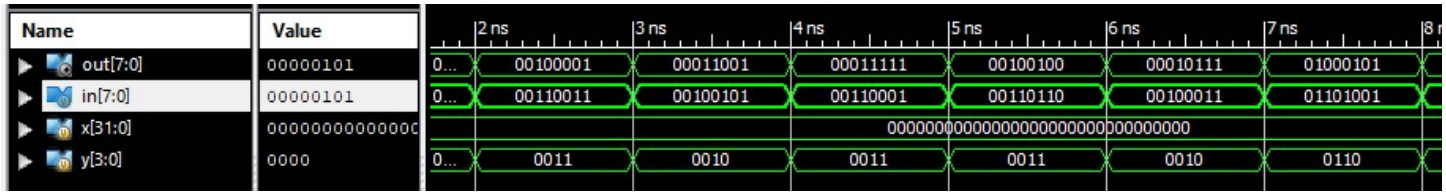
TB Code:

```
module tb();
reg [7:0]in;
wire [7:0] out;
integer x=0;
reg [3:0] y;
bcd_to_bin dut(in,out);

initial begin
  repeat(10)begin
          y = $random; //generating random input
          if (y > 9) y = y+6; //restricting it between 0 and 9
          in[3:0] = y; //assigning it to the lower bit

          y = $random; //generating random input
          if (y > 9) y = y+6; //restricting it between 0 and 9
          in[7:4] = y; //assigning it to the upper bit

          #1;
       if(out != in[7:4]*10 + in[3:0]) x = x+1; // self check if it is same
  end
  if(!x) $display("Success"); //print success when no loop raises error
  else $display("Failure"); // else print failure
  end
endmodule
```

RTL Diagram:



Output Waveform:



Simulation Output:

```
Console
ISim P.20131013 (signature 0x7708f090)
This is a Full version of ISim.
Time resolution is 1 ps
Simulator is doing circuit initialization process.
Finished circuit initialization process.
Success
```

Result:

The simulation output and the RTL diagram is observed and found to be valid.