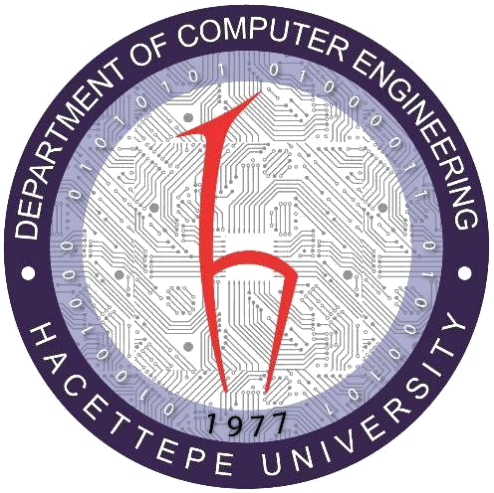


Hacettepe University
Computer Engineering Department

* BBM233 – Logic Design Lab. – Design Homework *

Group Members : Huzeyfe KOCABAŞ, Okan ALAN, M.Fatih ERBAĞ

Group Number : 12

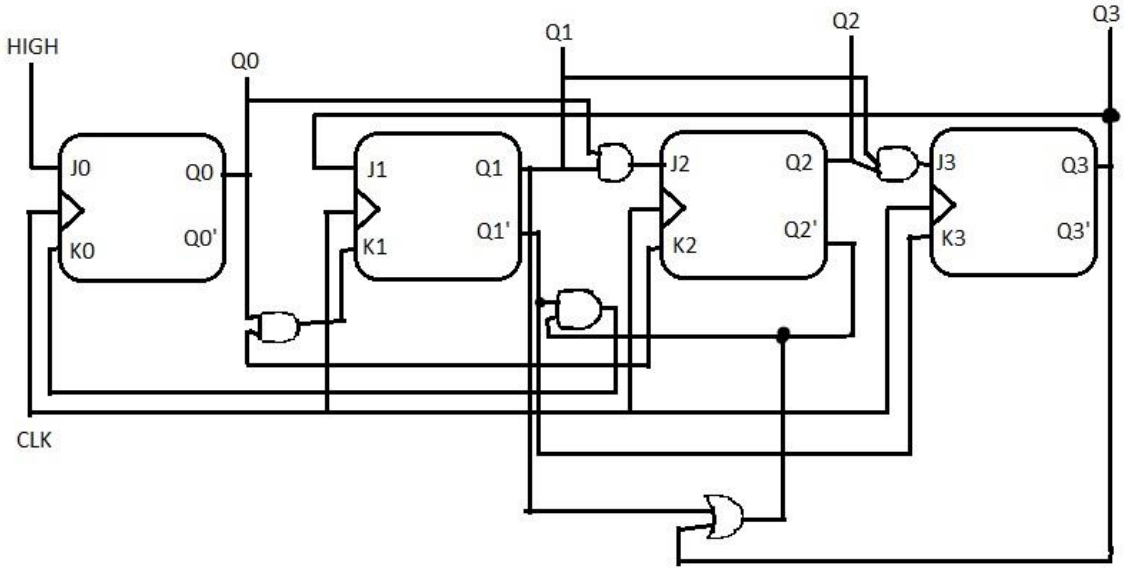
Subject : Prime Number Counter Design with JK FFs in Verilog

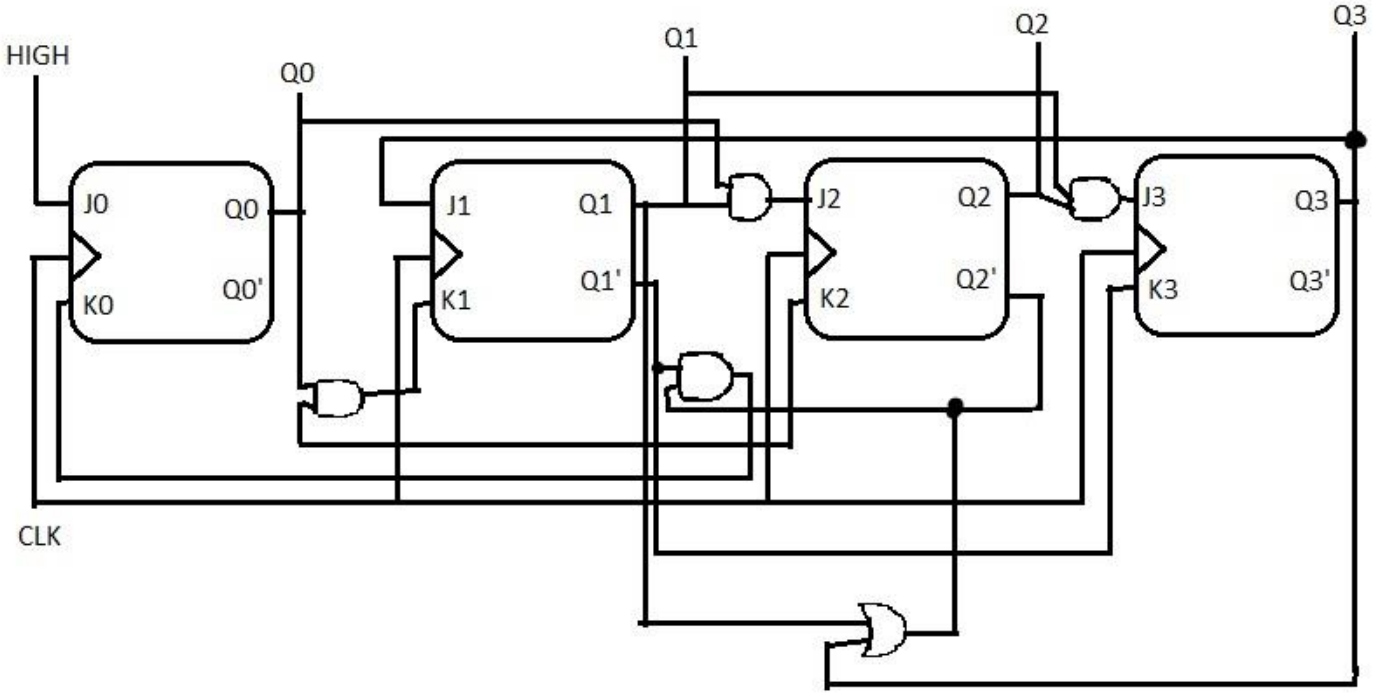
Data Due : 20/01/2018

Main Program : design_hw_pnc.v

Test Program : design_hw_tb.v

I. DESIGN & DESCRIPTION





II. IMPLEMENTATION & DETAILS

Then by following our design, we implement our code as below;

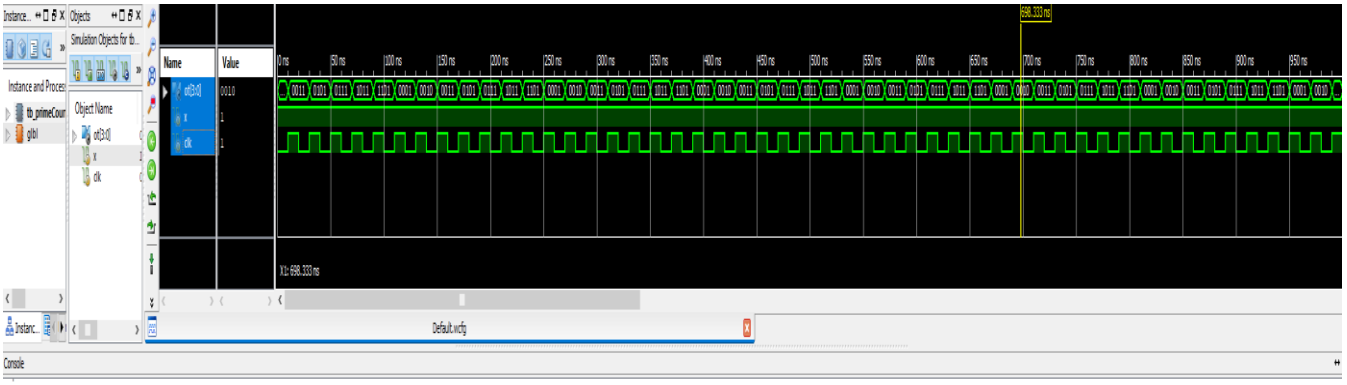
```
module jkffs(J,K,clock,Q,Qbar);

   input J,K,clock;
   output Q,Qbar;

   reg Q,Qbar;
   initial begin Q=1'b0; Qbar=1'b1; end
   always @(posedge clock)
      begin
            case({J,K})
                {1'b0,1'b0}:begin Q=Q; Qbar=Qbar; end
                {1'b0,1'b1}: begin Q=1'b0; Qbar=1'b1; end
                {1'b1,1'b0}:begin Q=1'b1; Qbar=1'b0; end
                {1'b1,1'b1}: begin Q=~Q; Qbar=~Qbar; end
            endcase
   end


endmodule



module primeCounter(
   input x,
   output [3:0]ot,
   input clk
   );

   wire q0,q1,q2,q3;

   jkffs f1(.J(1), .K(q1*q2), .clock(clk), .Q(ot[0]), .Qbar(q0));
   jkffs f2(.J(q3), .K(ot[0]*q2), .clock(clk), .Q(ot[1]), .Qbar(q1));
   jkffs f3(.J(ot[0]*ot[1]), .K(ot[1]+ot[3]), .clock(clk), .Q(ot[2]), .Qbar(q2));
   jkffs f4(.J(ot[2]*ot[1]), .K(q1), .clock(clk), .Q(ot[3]), .Qbar(q3));

endmodule
```

Actually f1's should J(x) we have no time to change this.

X is high from our design schema.

III.SAMPLE WAVEFORMS & TRUTH TABLE

We tried our code by test bench considering changes of clock(clk) values, it works correctly…



```
output 0011
output 0101
output 0111
output 1011
output 1101
output 0001
output 0010
output 0011
output 0101
output 0111
output 1011
output 1101
output 0001
output 0010
output 0011
output 0101
output 0111
output 1011
output 1101
output 0001
output 0010
output 0011
output 0101
output 0111
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output 1101
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```

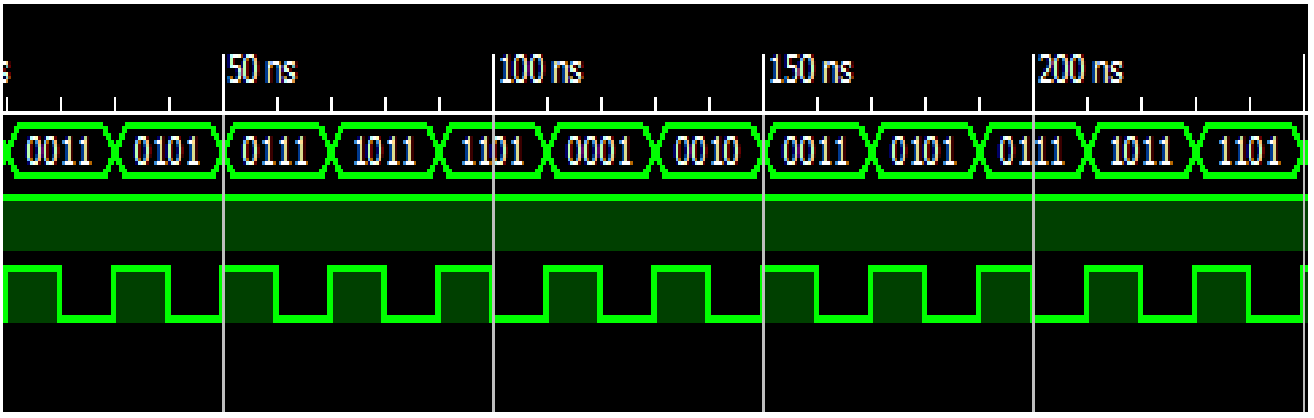

output 0011
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output 0001
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output 0011
output 0101
output 0111
output 1011
output 1101
output 0001
output 0010
output 0011
output 0101
output 0111
output 1011
output 1101
output 0001
output 0010
output 0011
output 0101
output 0111

Kmaps

PRESENT STATE				NEXT STATE			
Q3	Q2	Q1	Q0	Q3	Q2	Q1	Q0
0	0	0	1	0	0	1	0
0	0	1	0	0	0	1	1
0	0	1	1	0	1	0	1
0	1	0	1	0	1	1	1
0	1	1	1	1	0	1	1
1	0	1	1	1	1	0	1
1	1	0	1	0	0	0	1