DSD LAB

Week 6 Assignment Submission

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Batch B1

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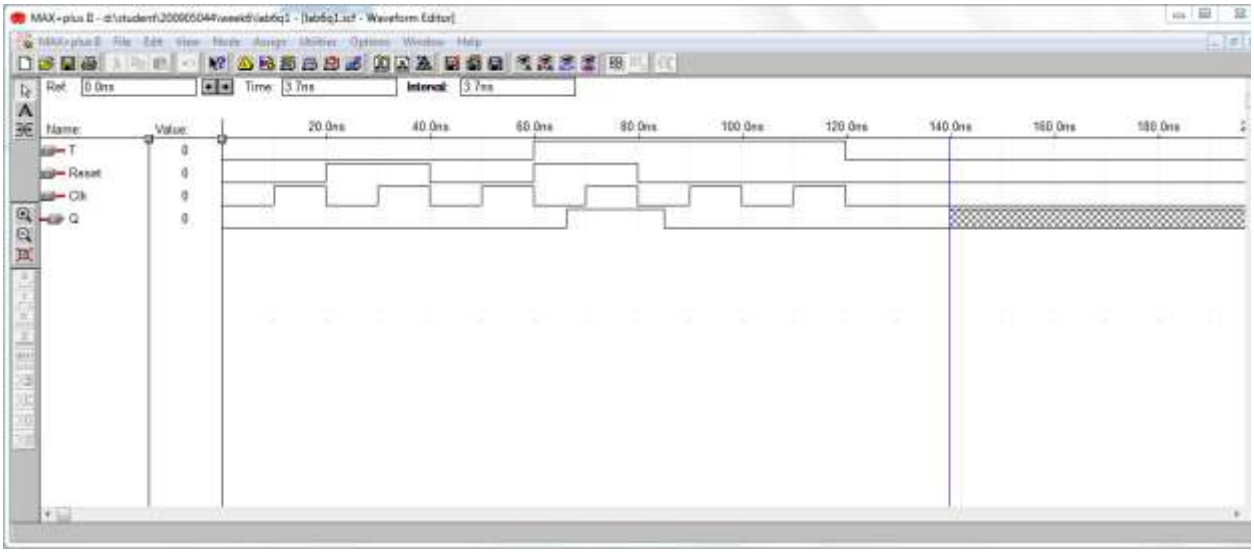
1. Write behavioral Verilog code for a negative edge triggered TFF with asynchronous active low reset.

Verilog code:

```
module lab6q1 (T, Clk, Q, Reset);
input Reset, T, Clk;
output Q;
reg Q;
always @ (negedge Clk or negedge Reset)
if (!Reset)
Q <= 0;
else if (T == 1)
Q <= ~Q;
endmodule
```

Output Waveform:



2. Write behavioral Verilog code for a positive edge-triggered JKFF with synchronous active high reset.

Verilog code:

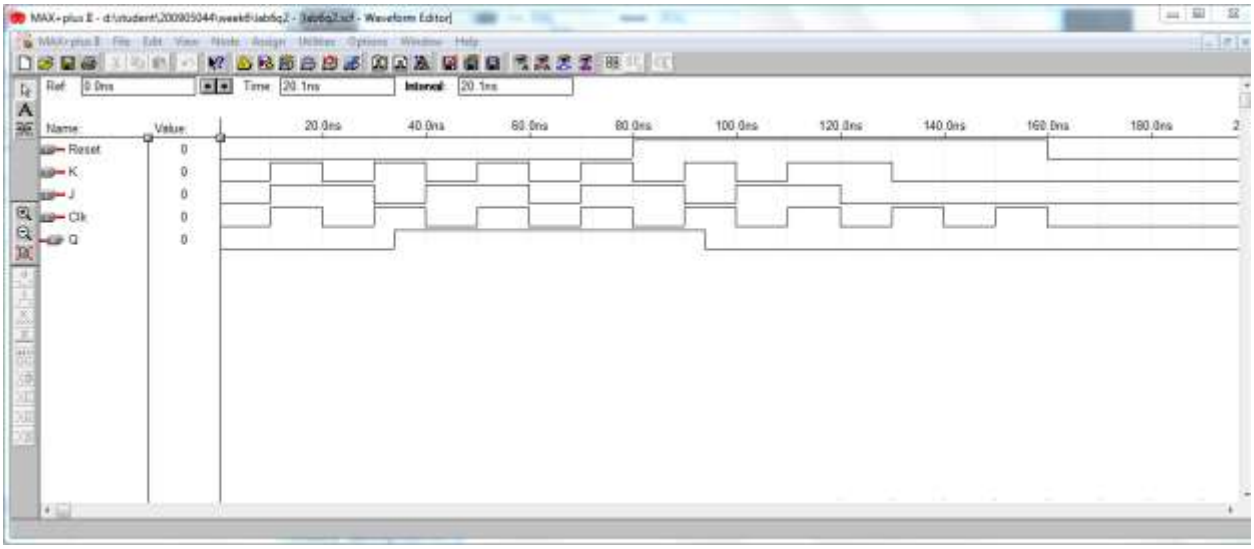
```
module lab6q2 (J, K, Clk, Reset, Q);

input J, K, Clk, Reset;

output Q;

reg Q;

always @ (posedge Clk)

if (Reset)

Q <= 0;

else

begin

case({J, K})

2'b00:Q<=Q;

2'b01:Q<=0;

2'b10:Q<=1;

2'b11:Q<=~Q;
```

endcase

end

endmodule

Output Waveform:



3. Design and simulate the following counters

a) 4-bit ring counter.

Verilog code:

module lab6q3a (clk, f);

input clk;

output[3:0] f;

wire[1:0] w;

dff1 stage0 (w[0] ^ w[1], clk, w[1]);

dff1 stage1 (~w[0], clk, w[0]);

dec24 stage2 (w, clk, f);

```
endmodule

module dff1 (d, clk, q);
input d;
input clk;
output q;
reg q;
always @ (posedge clk)
begin
q <= d;
end
endmodule

module dec24 (w, en, y);
input[1:0] w;
input en;
output[3:0] y;
reg[3:0] y;
always @ (posedge en)
begin
casex (w)
0:y = 4'b0001;
1:y=4'b0010;
2:y = 4'b0100;
```

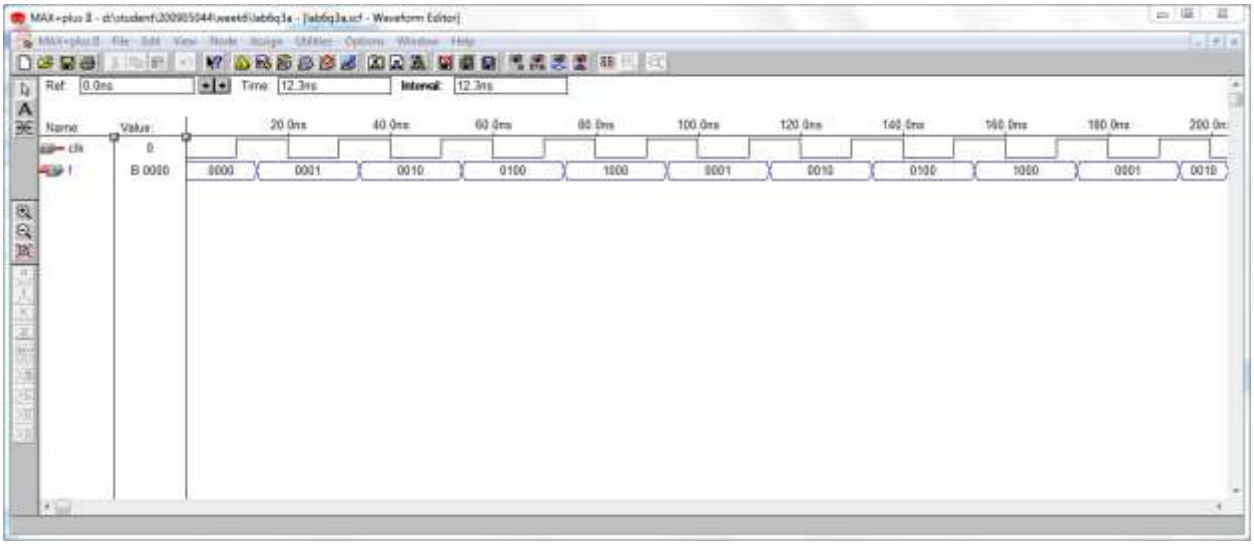
3:y=4'b1000;

endcase

end

endmodule

Output Waveform:



b) 5 bit Johnson counter.

Verilog code:

module lab6q3b (Clk, Q);

input Clk;

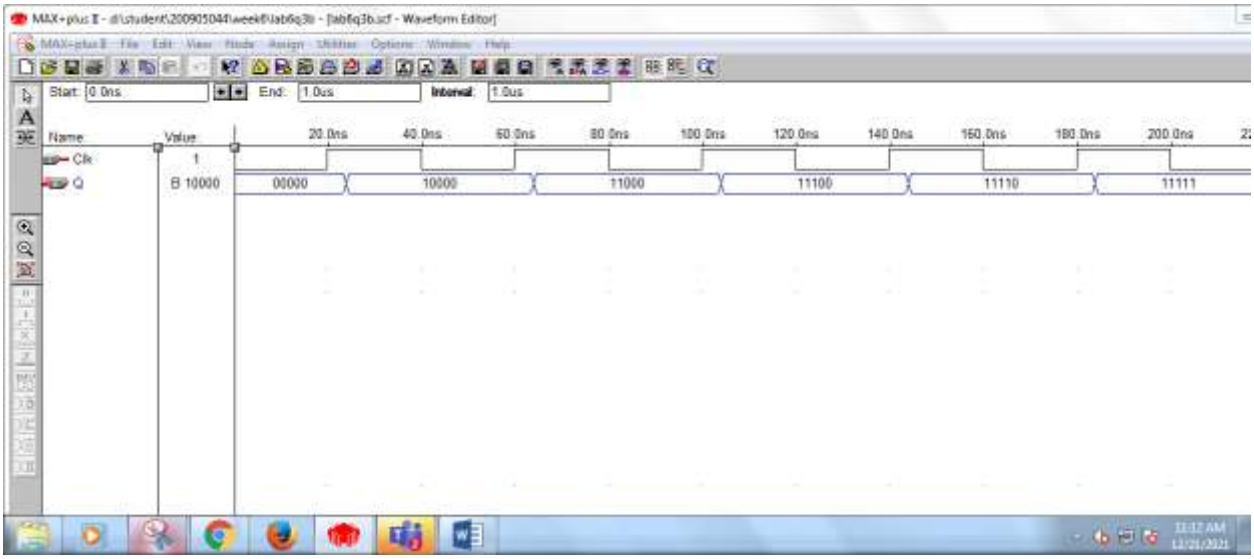
output[4:0] Q;

reg[4:0] Q;

always @ (posedge Clk)

```
begin
case (Q)
5'b00000: Q<=5'b10000;
5'b10000: Q<=5'b11000;
5'b11000: Q<=5'b11100;
5'b11100: Q<=5'b11110;
5'b11110: Q<=5'b11111;
5'b11111: Q<=5'b01111;
5'b01111: Q<=5'b00111;
5'b00111: Q<=5'b00011;
5'b00011: Q<=5'b00001;
5'b00001: Q<=5'b00000;
endcase
end
endmodule
```

Output Waveform:


MAX+plus II - d:\student\200905044\week6\lab6q3b - [lab6q3b.scf - Waveform Editor]
Start: 0.0ns
End: 1.0us
Interval: 1.0us
Name
Value
20.0ns
40.0ns
60.0ns
80.0ns
100.0ns
120.0ns
140.0ns
160.0ns
180.0ns
200.0ns
Clk
1
Q
B 10000
00000
10000
11000
11100
11110
11111

THANK YOU!