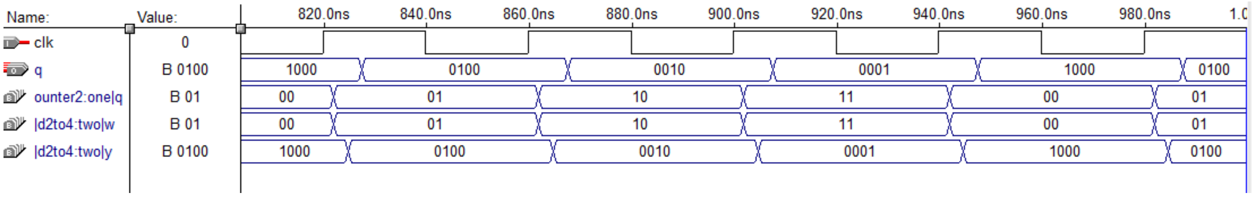
```
//ring counter code;

module ring1(clk,q);

input clk;

output[3:0]q;

wire [1:0]count;

wire en=1;

bitcounter2 one(clk,count[1:0]);

d2to4 two(en,count[1:0],q[3:0]);

endmodule

module dff11(clk,d,q);

input clk,d;

output q;

reg q;

always@(posedge clk)

begin

q=d;

end

endmodule

module d2to4(en,w,y);

input en;

input [1:0]w;

output [3:0]y;

reg [3:0]y;

always@(en or w)

begin

y=0;

if(en==1)

case(w)

0:y[3]=1;
```

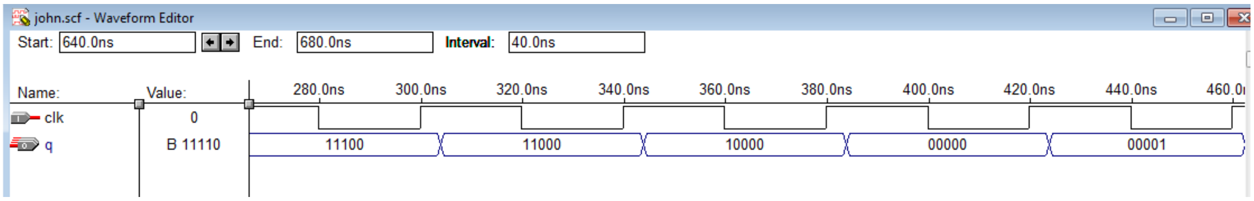
```
1:y[2]=1;
2:y[1]=1;
3:y[0]=1;
endcase
end
endmodule
module bitcounter2(clk,q);
input clk;
output[1:0]q;
dff11 ffo(clk,q[1]^q[0],q[1]);
dff11 ff1(clk,~q[0],q[0]);
endmodule
```



Johnson counter

```
module john(clk,q);
input clk;
output [4:0]q;
dff1 ffo(clk,~q[4],q[0]);
dff1 ff1(clk,q[0],q[1]);
dff1 ff2(clk,q[1],q[2]);
dff1 ff3(clk,q[2],q[3]);
dff1 ff4(clk,q[3],q[4]);
endmodule
 module dff1(clk,d,q);
```

```
input clk,d;

output q;

reg q;

always@(posedge clk)

begin

q=d;

end

endmodule
```



john.scf - Waveform Editor

Start: 640.0ns End: 680.0ns Interval: 40.0ns

Name: Value:

clk 0

q B 11110