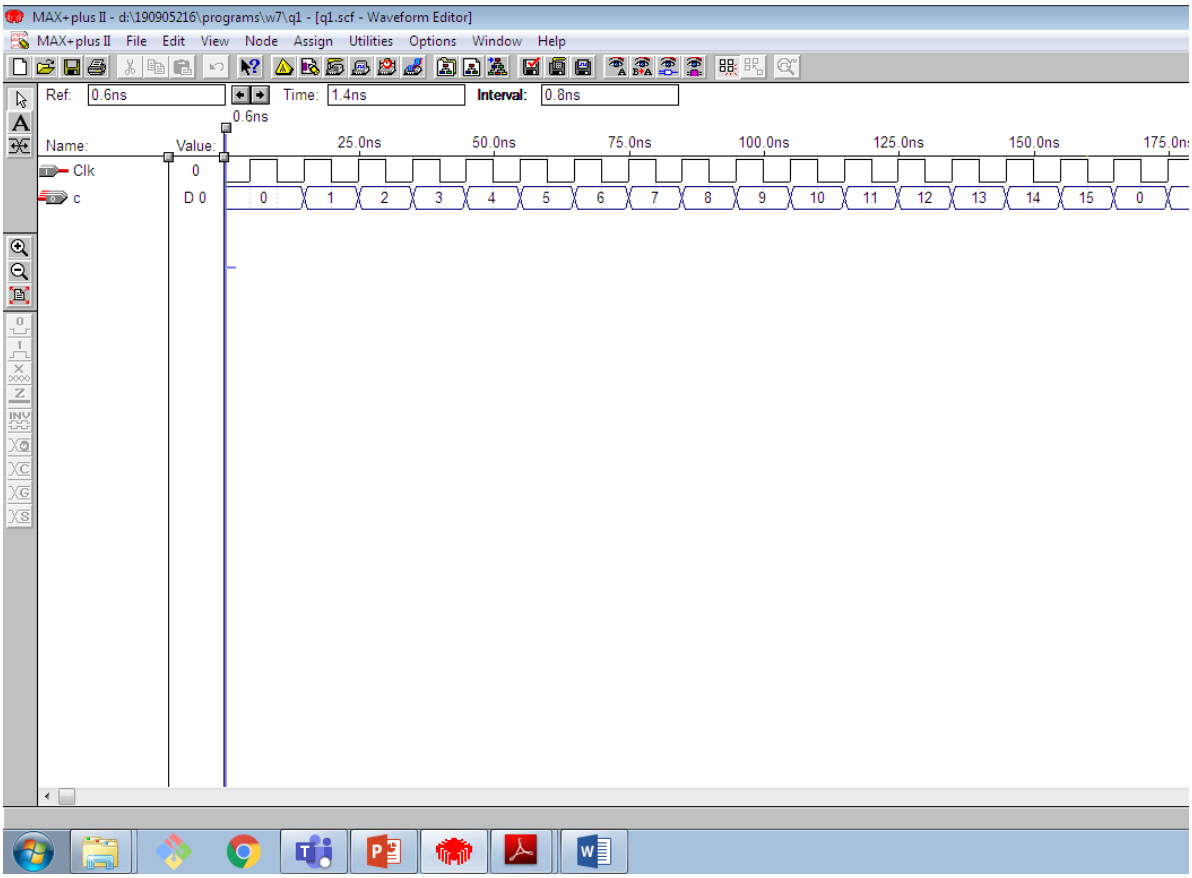
190905216_Week7

Q1:

```
module tf(Q, T, Clk);
input T, Clk;
output Q;
reg Q;
always @ (negedge Clk)
begin
if(!T)
Q <= Q;
else
Q <= ~Q;
end
endmodule

module q1(Clk, c);
input Clk;
output [3:0] c;
tf stage0 (1, Clk, c[0]);
tf stage1 (1 && c[0], Clk, c[1]);
tf stage2 (1 && c[0] && c[1], Clk, c[2]);
tf stage3 (1 && c[0] && c[1] && c[2], Clk, c[3]);
endmodule
```

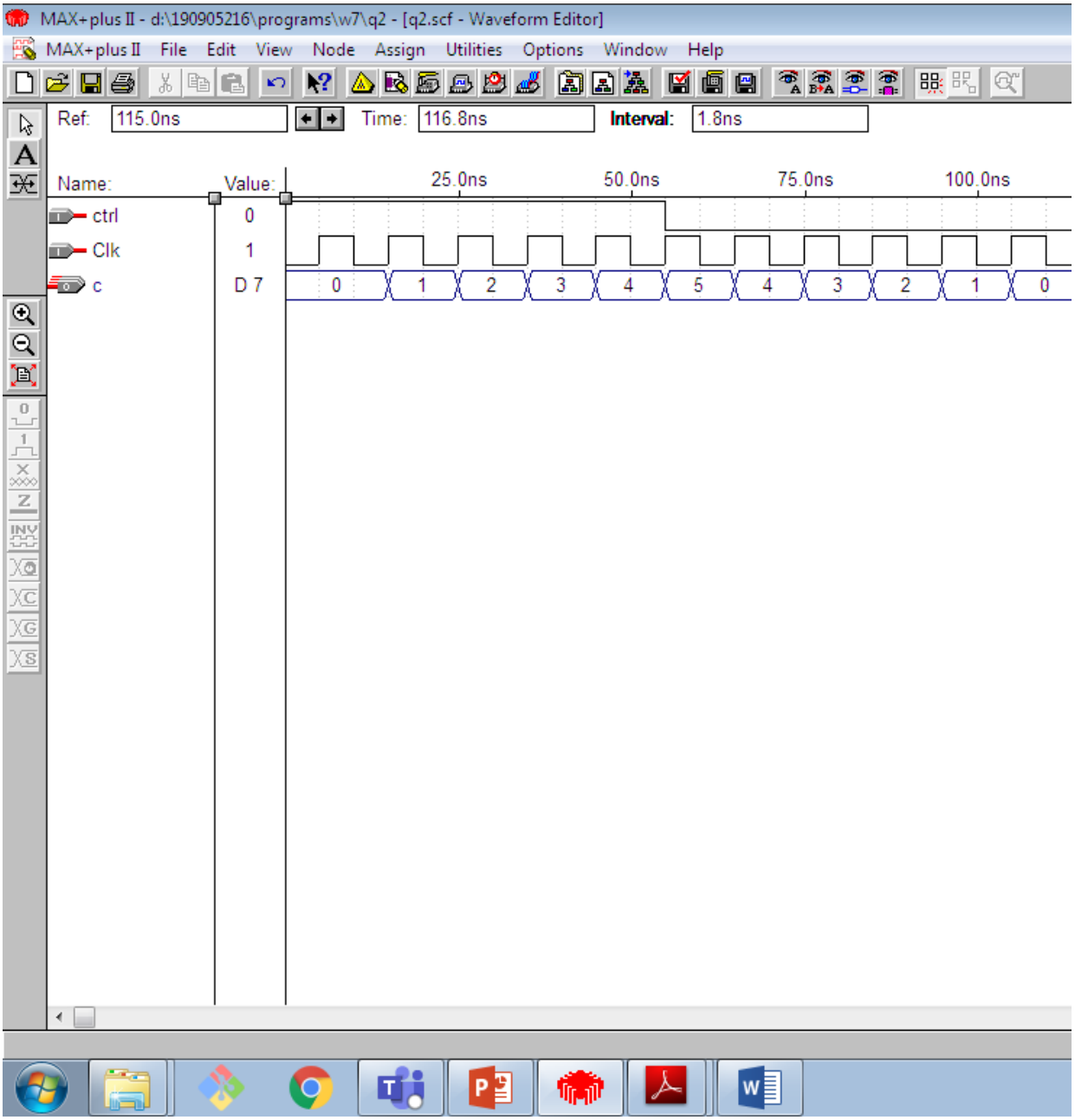


Waveform for 4 bit synchronous up counter

Q2:

```
module tf(T, Clk, Q);
input T, Clk;
output Q;
reg Q;
always @ (negedge Clk)
begin
if(!T)
Q <= Q;
else
Q <= ~Q;
end
endmodule

module q2(Clk, ctrl, c);
input Clk, ctrl;
output [2:0] c;
wire a, b;
tf stage0 (1, Clk, c[0]);
assign a = (ctrl && c[0]) || (~ctrl && ~c[0]);
tf stage1 (a, Clk, c[1]);
assign b = (ctrl && c[0] && c[1]) || (~ctrl && ~c[0] && ~c[1]);
tf stage2 (b, Clk, c[2]);
endmodule
```


MAX+plus II - d:\190905216\programs\w7\q2 - [q2.scf - Waveform Editor]
MAX+plus II File Edit View Node Assign Utilities Options Window Help
Ref: 115.0ns
Time: 116.8ns
Interval: 1.8ns
Name:
Value:
25.0ns
50.0ns
75.0ns
100.0ns
ctrl
0
Clk
1
c
D 7
0 1 2 3 4 5 4 3 2 1 0