Lab Assignment 3

Question 1 :

F(A, B, C)=ABC + A'BC + AB'C + ABC

Simplified function,

F = ABC + A'BC + AB'C + ABC

F = ABC + A'BC + AB'C (Removing Duplicates)

F = BC(A + A')+ AB'C (Taking BC Common)

F = BC+ AB'C (A + A' = 1)

F = C(B + AB') (Taking C Common)

F = C(B + A) (Absorption Law)

M = AC + BC

Truth Table:

A	B	C	AC	BC	AC + BC
0	0	0	0	0	0
0	0	1	0	0	0
0	1	0	0	0	0
0	1	1	0	1	1
1	0	0	0	0	0
1	0	1	1	0	1
1	1	0	0	0	0
1	1	1	1	1	1

Question 2 :

F(A, B, C)= ABCD’ + A’BC D+ AB’CD’ + ABC

Simplified function,

M = AC’D + BCD

Truth Table:

A	B	C	D	OUTPUT
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1

Question 3

F(A, B, C)= m{1, 3, 5, 7, 9, 11, 13}

Simplified function,

M = A'D + C'D + AB'D

Truth Table:

A	B	C	D	Output
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

Verilog Code:

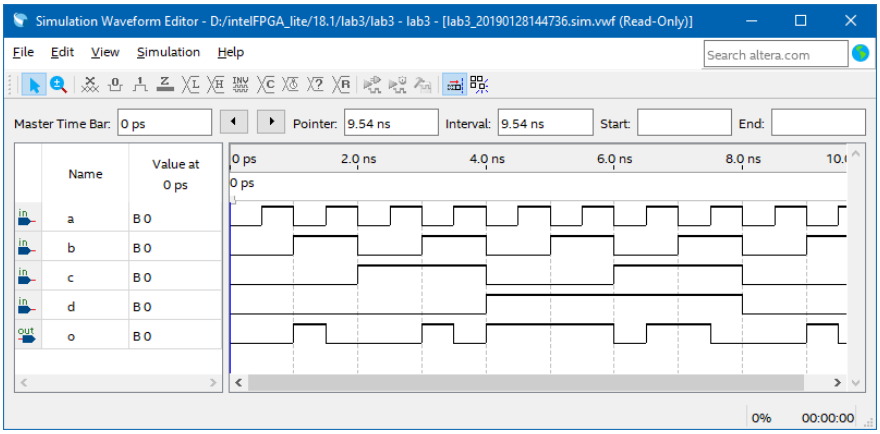
```
module main(a, b, c, d, o);
  input a, b, c, d;
  output o;

  wire p, q, r;

  and(p, ~a, b);
  and(q, ~c, d);
  and(r, a, ~b, d);
  or(o, p, q, r);

endmodule
```

Quatrus Prime Waveform



Question 4

F(A, B, C)= m {1, 2, 4, 6, 7, 9, 10, 11, 13}

Simplified function,

M = B'C'D+AC'D+A'BD'+A'BC+AB'C + B'CD'

Truth Table:

A	B	C	D	OUTPUT
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

Verilog Code:

```
module lab3_2(a, b, c, d, o);
  input a, b, c, d;
  output o;

  wire p, q, r, s, t, u;

  and(p, ~b, c, d);
  and(q, a, ~c, d);
  and(r, ~a, b, ~d);
  and(s, ~a, b, c);
  and(t, a, ~b, c);
  and(u, ~b, c, ~d);
  or(o, p, q, r, s, t, u);

endmodule
```

Quatrus Prime WaveForm: