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REPORT ON LAB 2
BEHAVIORAL SIMULATION

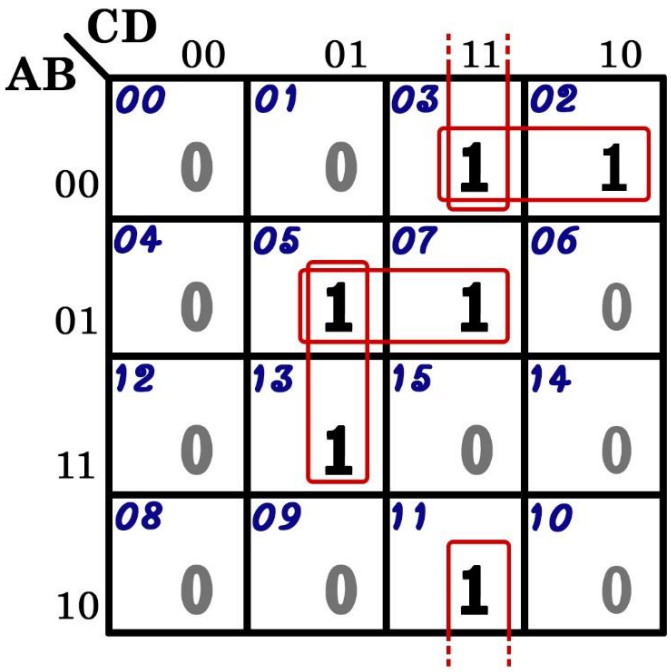
Assigned Lab Task

- Simplify the Boolean function that can find the prime numbers between o and 15.
- Build a logic circuit for that.
- Generate a project in Xilinx ISE Design Suite for the circuit.
- Assign various input combinations to check it.
- Use BASYS2 to verify the functionality of it.

Simplifying the Boolean expression

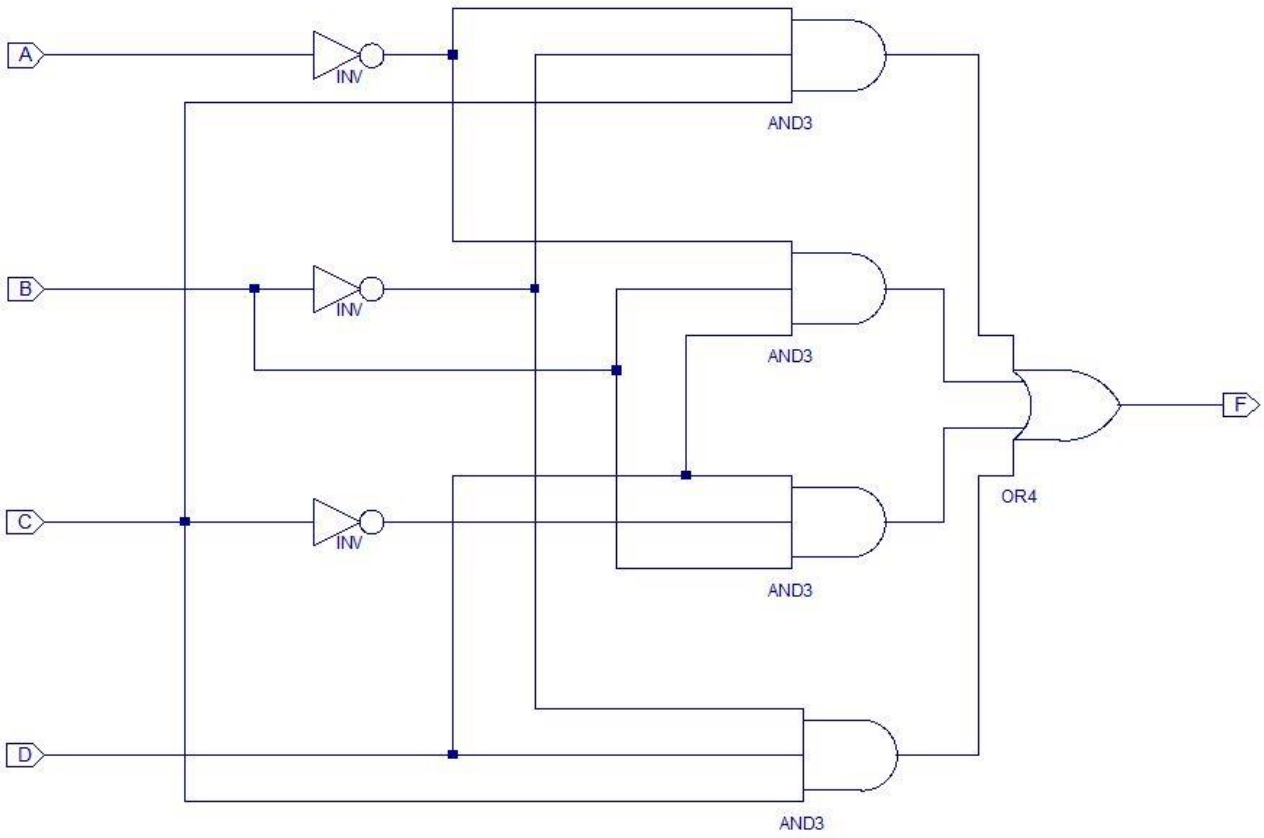
$$F(A,B,C) = \sum (2,3,5,7,11,13)$$

Karnaugh Map



$$F = \bar{A}\bar{B}D + \bar{A}BC + \bar{B}CD + B\bar{C}D$$

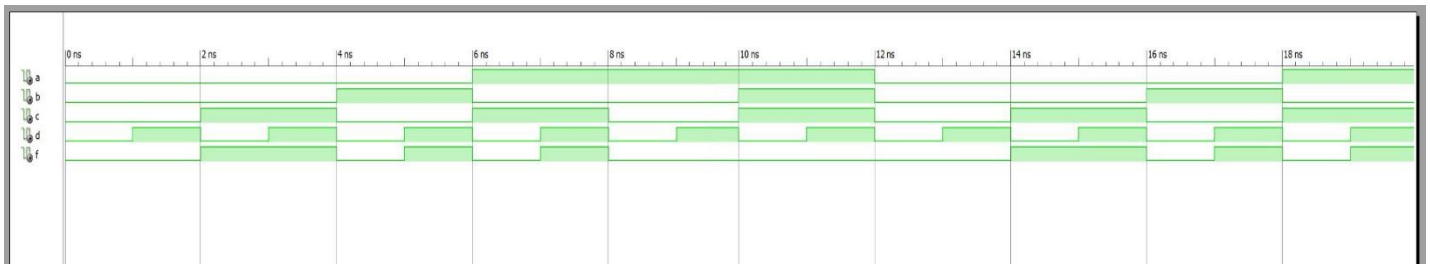
Schematic circuit diagram from ISE



Test Bench code having all possible inputs and outputs

```
35  -- *** Test Bench - User Defined Section ***
36      tb : PROCESS
37      BEGIN
38          -- Make sure to set initial values for A, B, C, & D
39          A <= '0';
40          B <= '0';
41          C <= '0';
42          D <= '0';
43          -- Repeat signals to form waveforms
44          ABC_loop: LOOP
45              WAIT FOR 1 ns;
46              D <= NOT D; -- invert D
47              WAIT FOR 1 ns;
48              D <= NOT D;
49              C <= NOT C;
50              WAIT FOR 1 ns;
51              D <= NOT D;
52              WAIT FOR 1 ns;
53              D <= NOT D;
54              C <= NOT C;
55              B <= NOT B;
56              WAIT FOR 1 ns;
57              D <= NOT D;
58          -- fill the rest to get proper sequence
59              WAIT FOR 1 ns;
60              D <= NOT D;
61              C <= NOT C;
62              B <= NOT B;
63              A <= NOT A;
64          END LOOP ABC_loop;
65          WAIT; -- will wait forever
66      END PROCESS;
67  -- *** End Test Bench - User Defined Section ***
68  END;
```

Timing Diagram from ISim showing all possible inputs and outputs



Conclusion

At the end of this lab, I was able to design and develop simple logic circuit using schematics and was able to verify the functionality of those circuits through simulation and verify its functionality on the development board.