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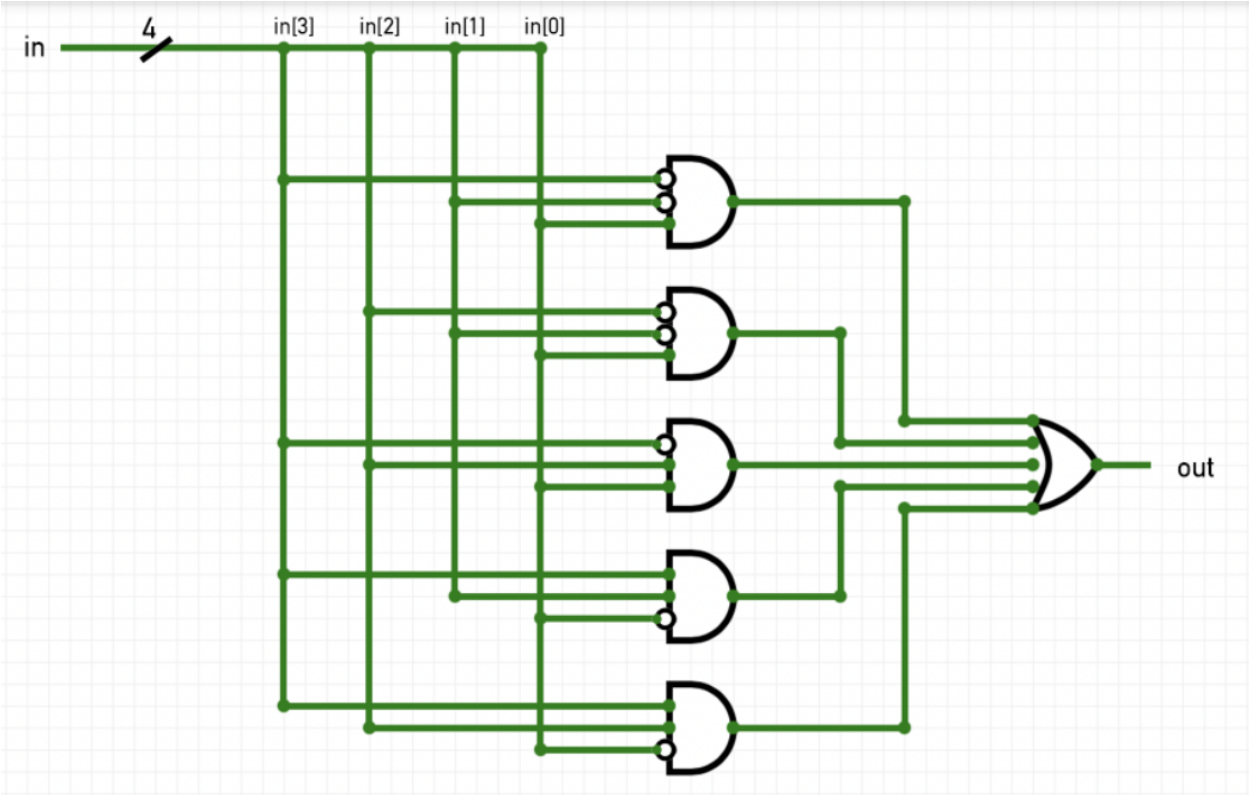
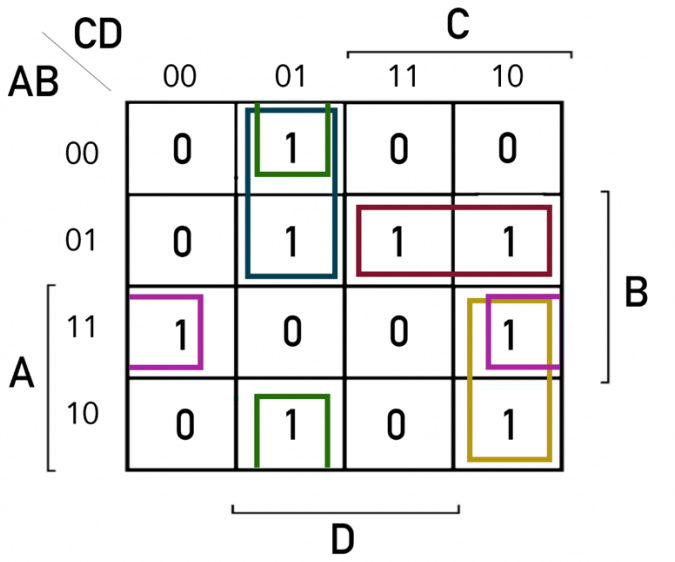
Logic Design Lab 1 Kevin Number Generator - Report

1. *Design Process*
   - First, create a K-Map based on the Kevin Number (1,5,6,7,9,10,12,14) as the min terms.
   - Then, obtain the logic equation from grouping the K-Map.
   - Then draw the logic circuit diagram with “and” and “or” gates.
   - Next, start to implement in Verilog.
   - First make the Gate Level Description,
   - Then Dataflow Description,
   - Then the Behavior Description.
   - Create the Testbench according to the Kevin Number given.
   - Use NC-Verilog to simulate and verify.
   - If execution result is wrong, start debugging the code and the testbench.

2. *Circuit Diagram*



3. *K-map*



F(A,B,C,D) = A'C'D + B'C'D + A'BC + ACD' + ABD'

4. *Execution result*

```
ncsim> run
Kevin Number Detector
| Time=   5 | Input=0000 | Gate=0 | Dataflow=0 | Behaviour=0 |
| Time=  10 | Input=0001 | Gate=1 | Dataflow=1 | Behaviour=1 |
| Time=  15 | Input=0010 | Gate=0 | Dataflow=0 | Behaviour=0 |
| Time=  20 | Input=0011 | Gate=0 | Dataflow=0 | Behaviour=0 |
| Time=  25 | Input=0100 | Gate=0 | Dataflow=0 | Behaviour=0 |
| Time=  30 | Input=0101 | Gate=1 | Dataflow=1 | Behaviour=1 |
| Time=  35 | Input=0110 | Gate=1 | Dataflow=1 | Behaviour=1 |
| Time=  40 | Input=0111 | Gate=1 | Dataflow=1 | Behaviour=1 |
| Time=  45 | Input=1000 | Gate=0 | Dataflow=0 | Behaviour=0 |
| Time=  50 | Input=1001 | Gate=1 | Dataflow=1 | Behaviour=1 |
| Time=  55 | Input=1010 | Gate=1 | Dataflow=1 | Behaviour=1 |
| Time=  60 | Input=1011 | Gate=0 | Dataflow=0 | Behaviour=0 |
| Time=  65 | Input=1100 | Gate=1 | Dataflow=1 | Behaviour=1 |
| Time=  70 | Input=1101 | Gate=0 | Dataflow=0 | Behaviour=0 |
| Time=  75 | Input=1110 | Gate=1 | Dataflow=1 | Behaviour=1 |
| Time=  80 | Input=1111 | Gate=0 | Dataflow=0 | Behaviour=0 |
Congratulations! :D

Simulation complete via $finish(1) at time 80 NS + 0
./kevin_tb.v:26                $finish;
ncsim> exit
```

5. *Problem faced & how to deal*
    1. Figuring out how to enter the workstation because it keeps showing wrong password.
        Keep on trying until it somehow works and change the password.
    2. Uploading the file to execute
        Instead of using terminal to upload and download file, tried using Filezilla instead
    3. The program had bugs and didn't work, it only showed the first two outputs and results in wrong answer
        Turns out the problem was in the testbench, in the if statement for input.
        Debugged the code and it works now

6. *Questions for TA*

    - Some of the tutorials in HackMD are still in Chinese, so it's a bit hard to understand, can you please translate it to English version?