LSV PA1

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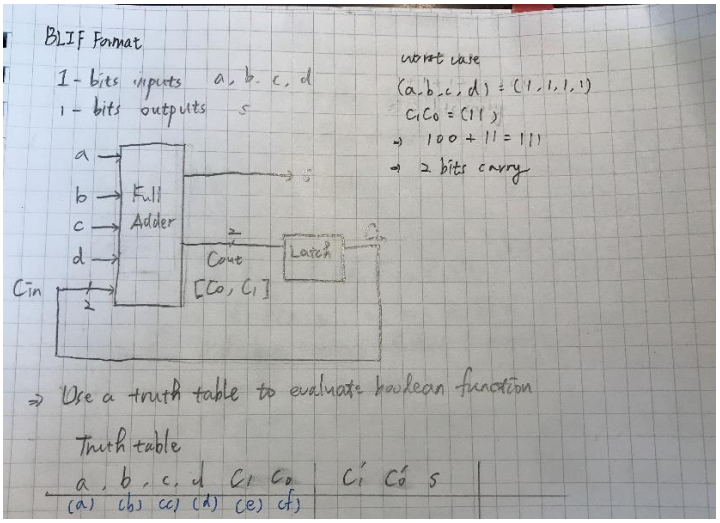
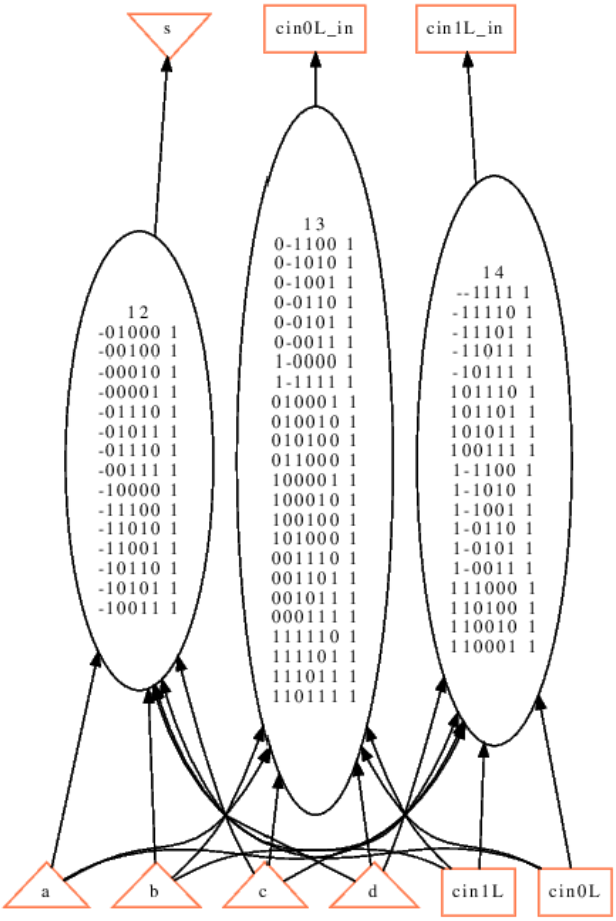
Part A

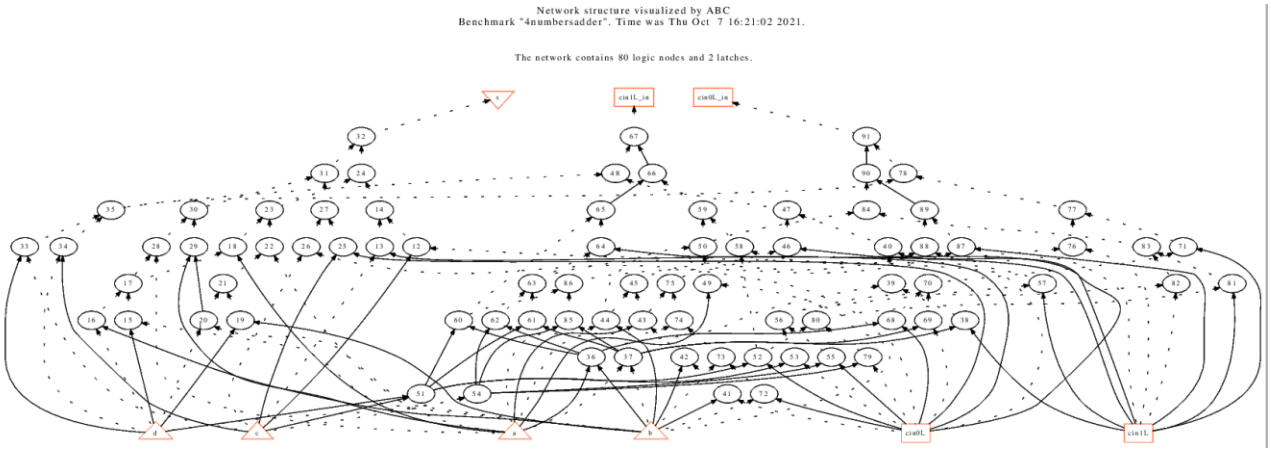


Network structure visualized by ABC
Benchmark "4numbersadder". Time was Thu Oct 7 16:18:31 2021.

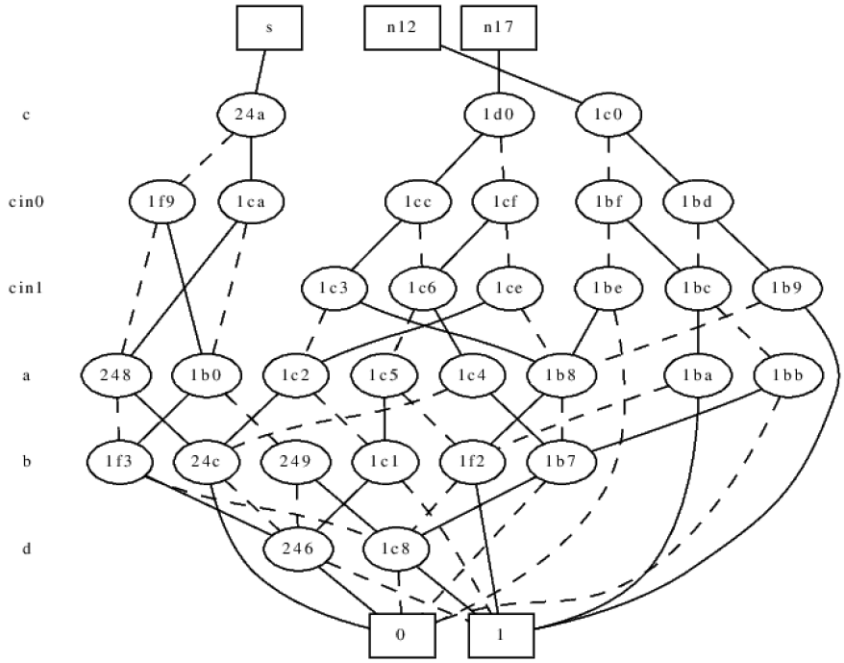
The network contains 3 logic nodes and 2 latches.



After strash



show_bdd -g



Part B

(a) Compare the following differences with the four-number serial adder example.

- logic network in AIG (by command aig) vs. structurally hashed AIG (by command strash)

AIG: Converts local functions of the nodes to AIGs, relation between nodes are unchanged, node structure remains.

Strash: Convert global network to AIGs by one-level structural hashing, nodes structure is no longer maintained

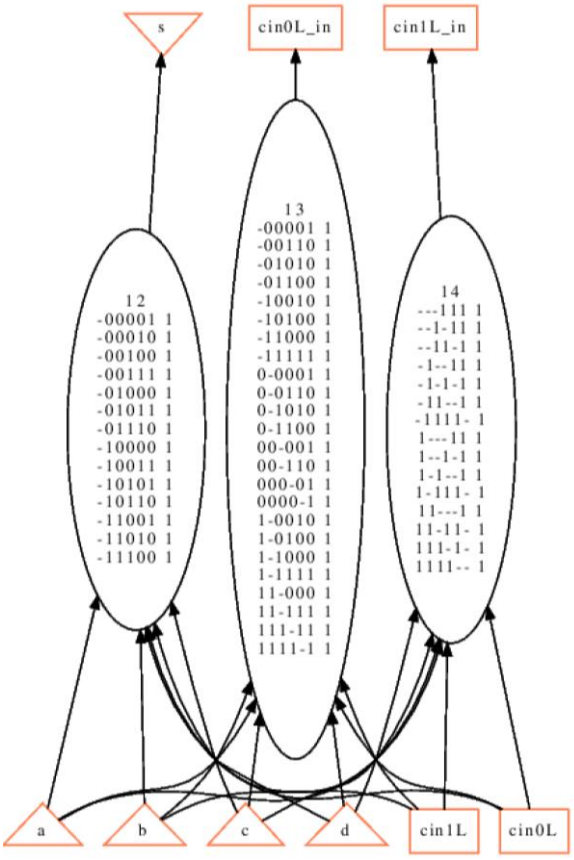
```
abc 25> read lsv_fall_2021/pa1/4numbersadder.blif
abc 26> aig
abc 26> print_stats
4numbersadder               : i/o =    4/    1  lat =    2  nd =     3  edge =     18  aig  =   1
01  lev = 1
```

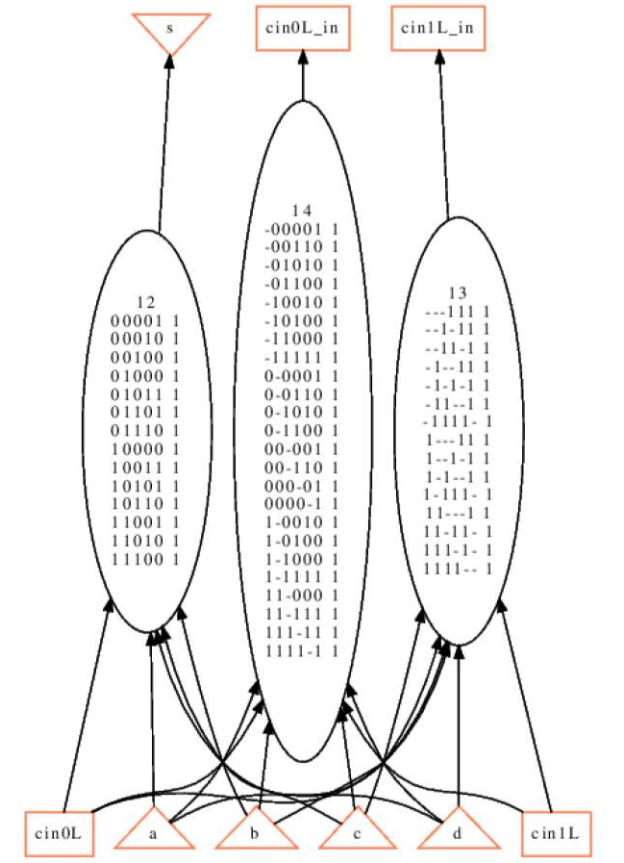
```
abc 28> read lsv_fall_2021/pa1/4numbersadder.blif
abc 29> strash
abc 30> print_stats
4numbersadder                : i/o =    4/    1  lat =    2  and =     80  lev =  8
```

- logic network in BDD (by command bdd) vs. collapsed BDD (by command collapse)

bdd: Converts local functions of the nodes to BDDs. (nodes number remained unchanged, level unchanged)

Collapse: Recursively composes the fanin nodes into the fanout nodes resulting in a network, it is built by global BDDs (level changed because each CO is composed by a node whose fanins are CIs, here because original circuit is one-level already, so differences are minor. However, some differences can be observed from command print_stats)





Aig Collapse

(b) Given a structurally hashed AIG, find a sequence of ABC command(s) to convert it to a logic network with node function expressed in sum-of-products (SOP).

BDD based SOP generation: collapse + sop

```
abc 11> read lsv_fall_2021/pa1/4numbersadder.blif
abc 12> strash
abc 13> collapse
abc 14> sop
abc 14> print_stats
4numbersadder               : i/o =    4/    1  lat =    2  nd =     3  edge =     17  cube =
53  lev = 1
```

SAT based SOP generation: satclp

```
abc 08> read lsv_fall_2021/pa1/4numbersadder.blif
abc 09> strash
abc 10> print_stats
4numbersadder               : i/o =    4/    1  lat =    2  and =     80  lev =  8
abc 10> satclp
abc 11> print_stats
4numbersadder               : i/o =    4/    1  lat =    2  nd =     3  edge =     17  cube =
51  lev = 1
```