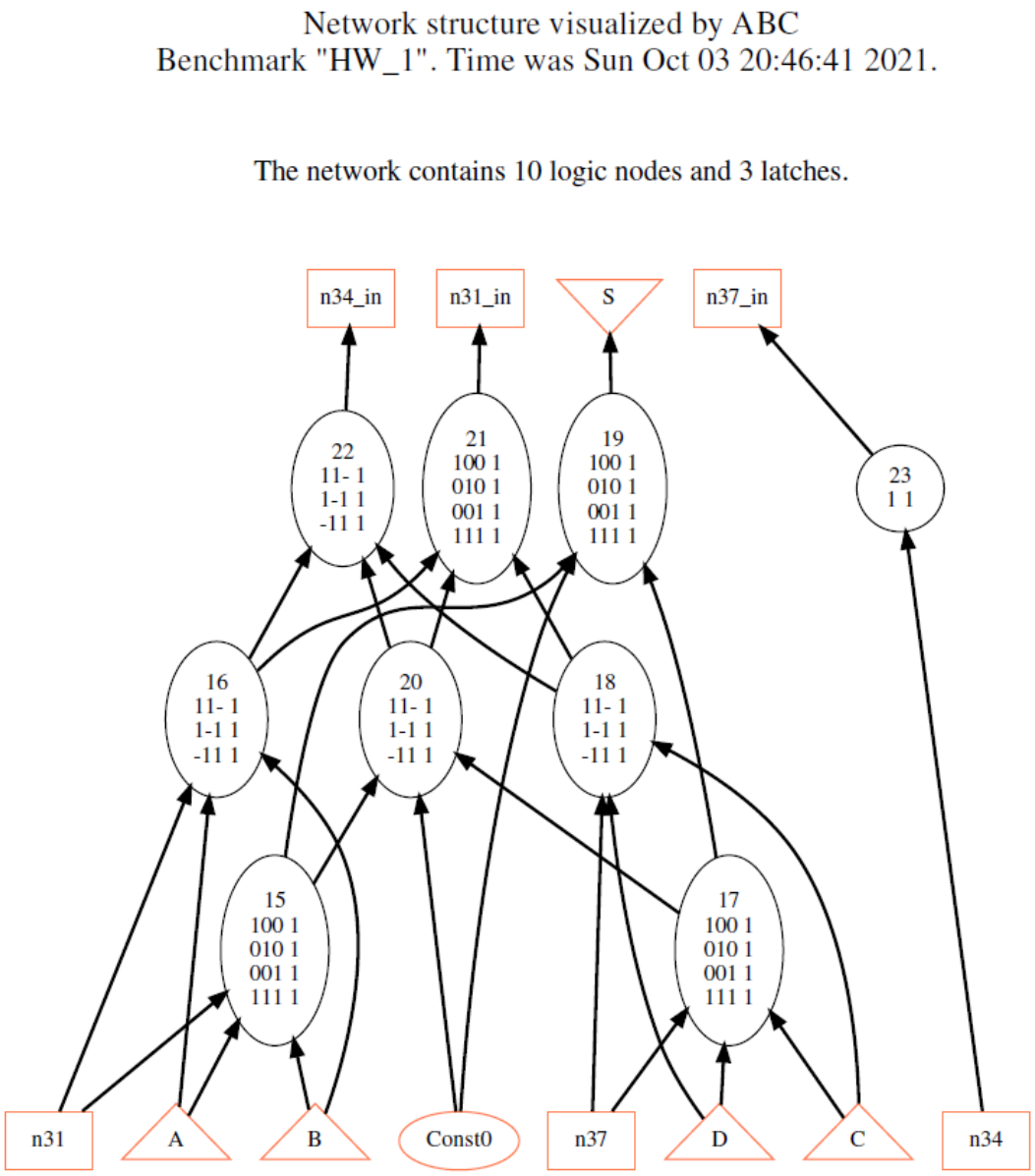
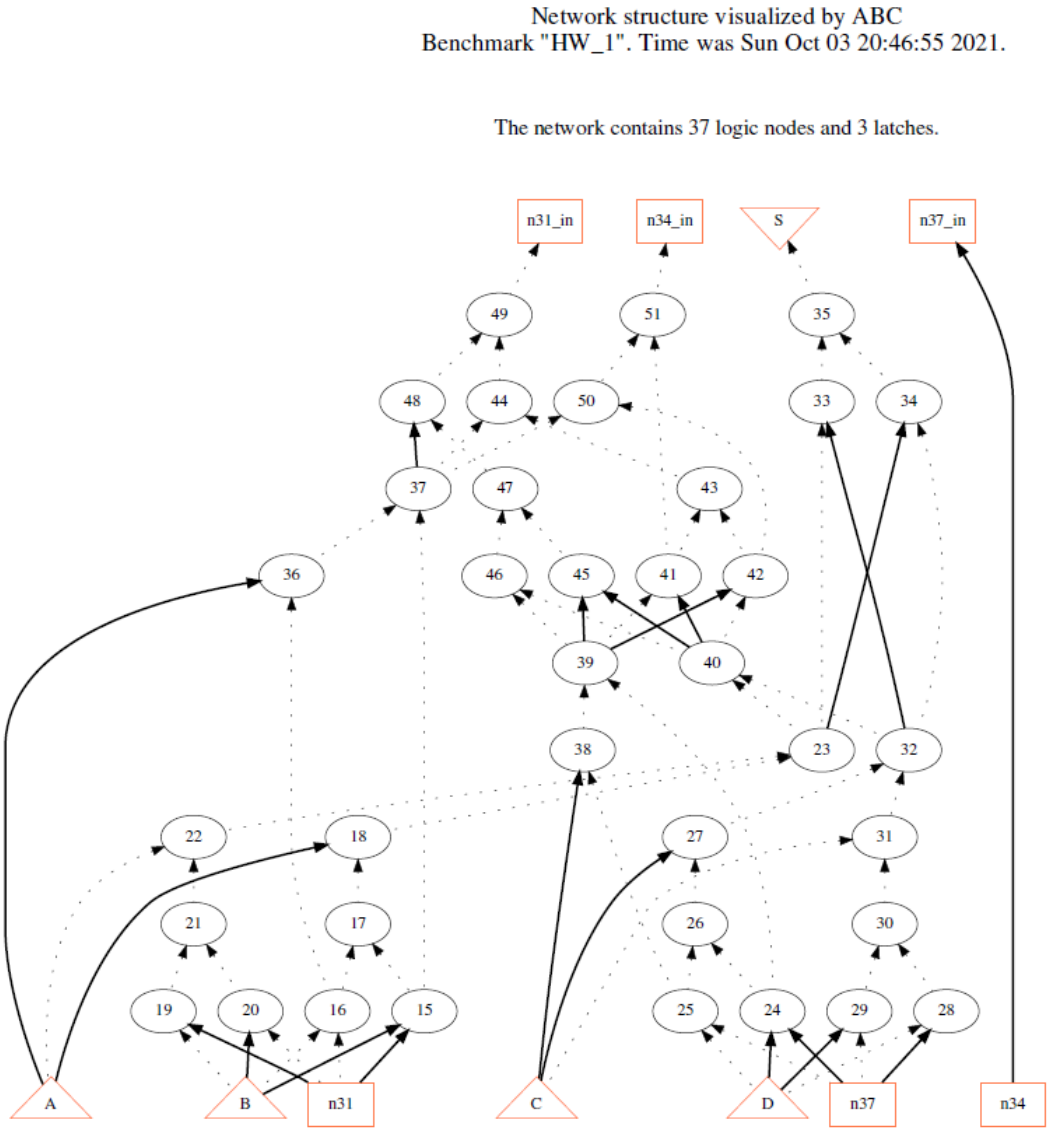
1 [Using ABC]

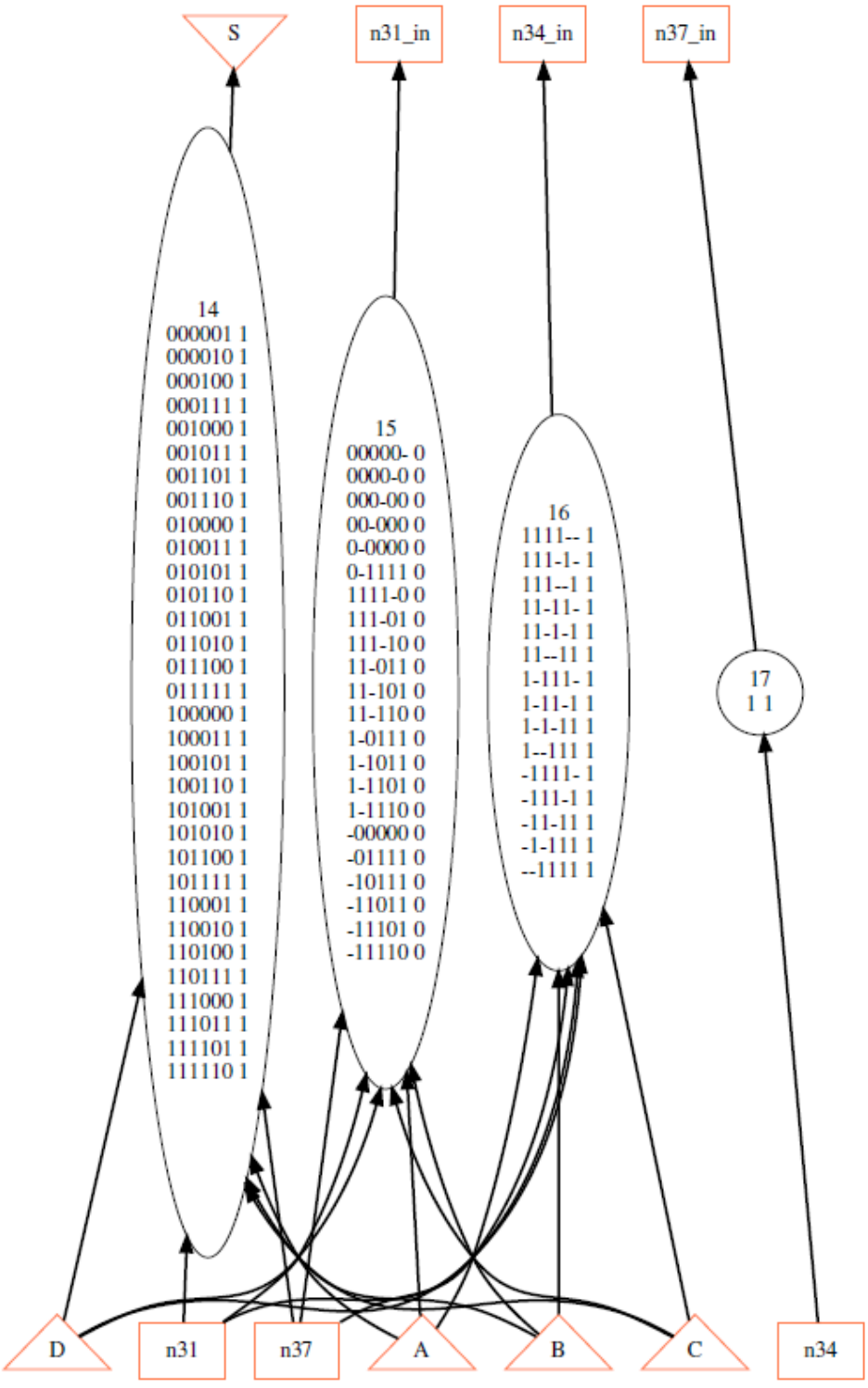
visualize the network structure (command “show”)



Visualize the AIG (command “show”)



Visualize the BDD (command “show bdd -g”



2 [ABC Boolean Function Representations]

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

1. logic network in AIG vs. structurally hashed AIG

ANS:

“aig”: Only converts local functions of the nodes to AIGs.

“strash”: Transforms the current network into an AIG by one-level structural hashing. The resulting AIG is a logic network composed of two-input AND gates and inverters represented as complemented attributes on the edges. Structural hashing is a purely combinational transformation, which does not modify the number and positions of latches.

```
UC Berkeley, ABC 1.01 (compiled Feb 13 2011 19:06:26)
abc 01> read HW_1.blif
UC Berkeley, ABC 1.01 (compiled Feb 13 2011 19:06:26)
abc 01> read HW_1.blif
Warning: The network contains hierarchy.
Hierarchy reader flattened 8 instances of logic boxes and left 0 black boxes.
abc 02> aig
abc 02> print_stats
HW_1         : i/o =    4/    1  lat =    3  nd =    10  edge =     25  aig  =    52  lev =  3
abc 02> strash
abc 03> print_stats
HW_1         : i/o =    4/    1  lat =    3  and =     37  lev =  9
```

2. logic network in BDD (by command “bdd”) vs. collapsed BDD (by com□mand “collapse”)

ANS:

“bdd”: Only converts local functions of the nodes to BDDs.

“collapse”: Recursively composes the fanin nodes into the fanout nodes resulting in a network, in which each CO is produced by a node, whose fanins are CIs. Collapsing is performed by building global functions using BDDs and is, therefore, limited to relatively small circuits. After collapsing, the node functions are represented using BDDs.

```
abc 01> read HW_1.blif
Warning: The network contains hierarchy.
Hierarchy reader flattened 8 instances of logic boxes and left 0 black boxes.
abc 02> bdd
abc 02> print_stats
HW_1         : i/o =    4/    1  lat =    3  nd =    10  edge =     25  bdd  =    28  lev =  3
abc 02> collapse
Shared BDD size =     33 nodes.  BDD construction time =    0.00 sec
abc 03> print_stats
HW_1         : i/o =    4/    1  lat =    3  nd =     4  edge =     19  bdd  =    28  lev =  1
```

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

ANS:

Command “logic”