LSV PA1 report

r12943105 電子所丁組碩一 盤禹宏

- Problem 2

(a) The mul.blif file is shown below. Can also be found in the folder.

```
.model 2bit_unsigned_multiplier
.inputs a1 a0 b1 b0
.outputs y3 y2 y1 y0
.names a1 a0 b1 b0 y0 #odd numbers
-1-1 1
.names a1 a0 b1 b0 y1 #2,3,6,7. only 2,3,6
0110 1
1001 1
0111 1
1101 1
1011 1
1110 1
.names a1 a0 b1 b0 y2 #4~7. only 4,6
1010 1
1011 1
1110 1
.names a1 a0 b1 b0 y3 #>=8. only 3*3
1111 1
.end

# 0000 0000
# 0001 0000
# 0010 0000
# 0011 0000
# 0100 0000
# 0101 0001
# 0110 0010
# 0111 0011
# 1000 0000
# 1001 0010
# 1010 0100
# 1011 0110
# 1100 0000
# 1101 0011
# 1110 0110
# 1111 1001

```

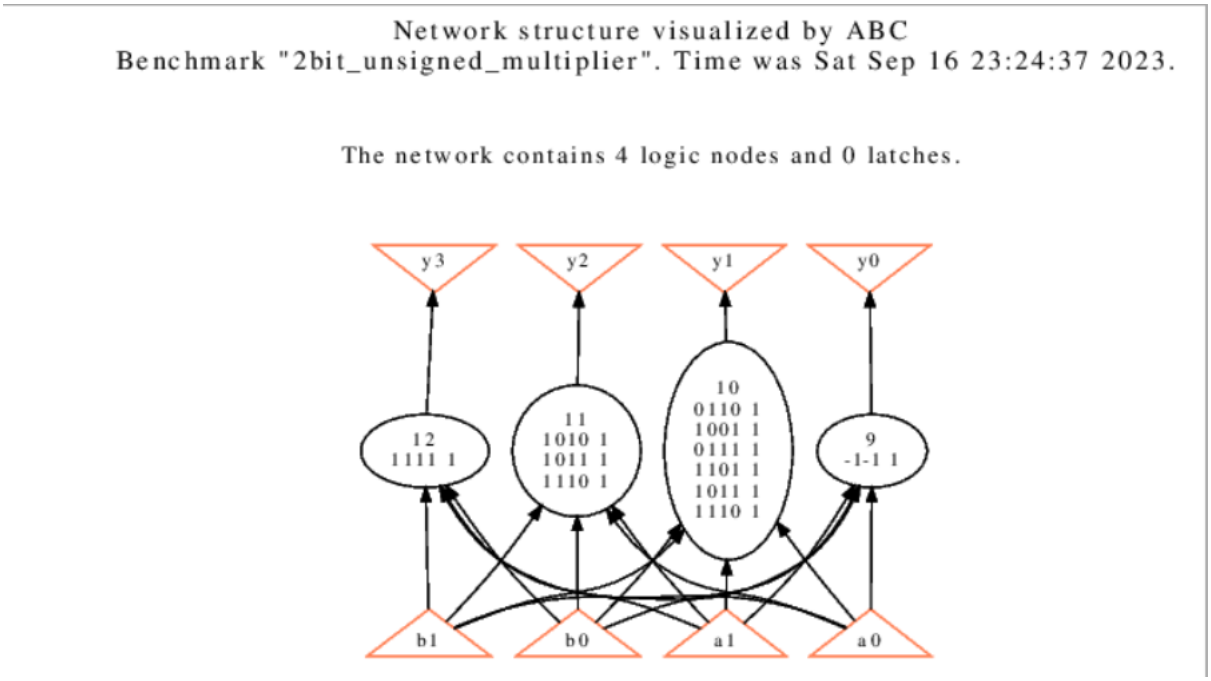
(b) Commands

1. read mul.blif
2. print_stats

```
abc 01> read mul.blif
abc 02> print_stats
2bit_unsigned_multiplier      : i/o =    4/    4  lat =    0  nd =     4  edge =     16  cube =    11  lev = 1
```

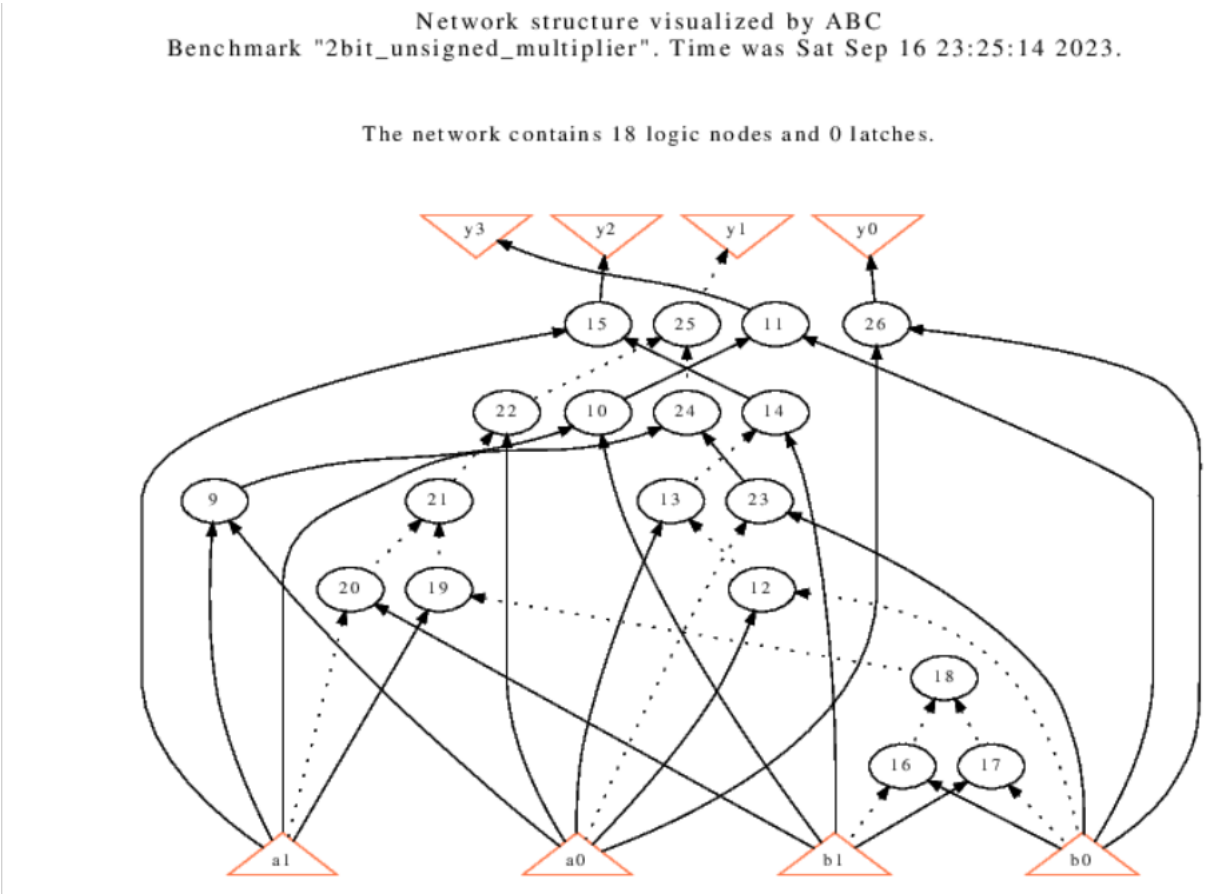
3. show

```
abc 02> show
abc 02> Warning: Missing charsets in String to FontSet conversion

abc 02>
```



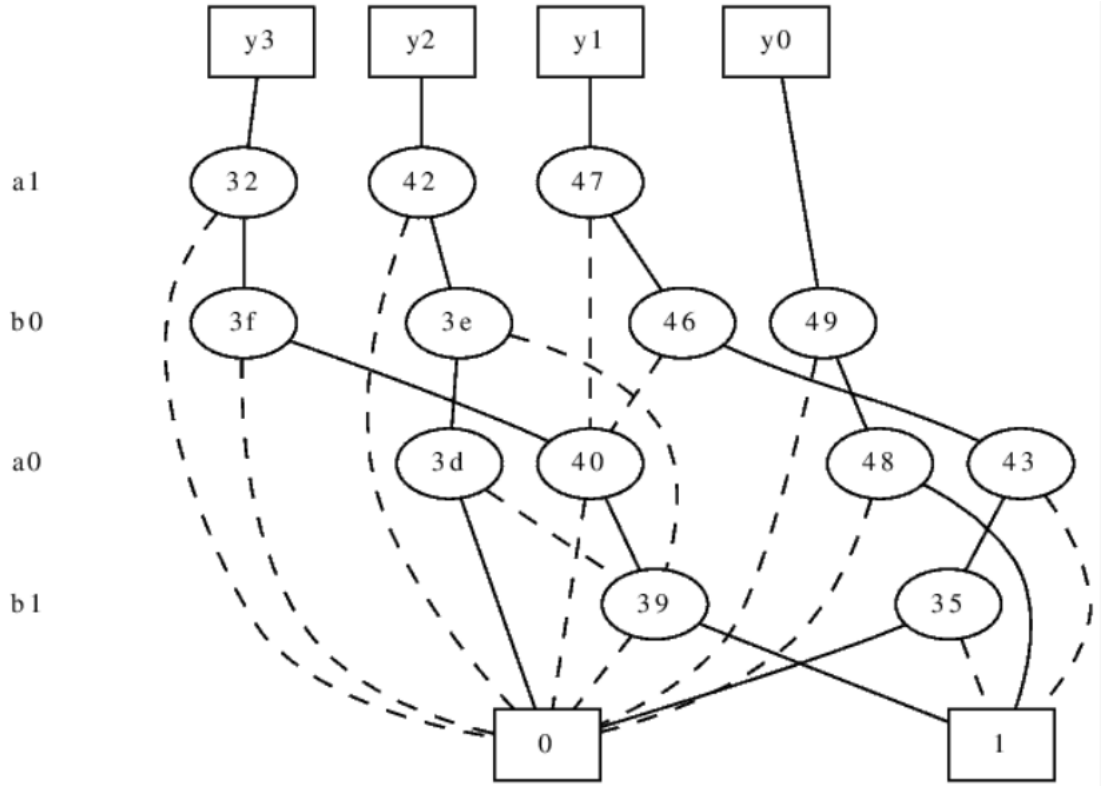
4. strash
5. show

```
abc 02> strash
abc 03> show
abc 03> Warning: Missing charsets in String to FontSet conversion

abc 03>
```



6. collapse
7. show_bdd -g

```
abc 03> collapse
abc 04> show_bdd -g
abc 04> Warning: Missing charsets in String to FontSet conversion

abc 04>
```



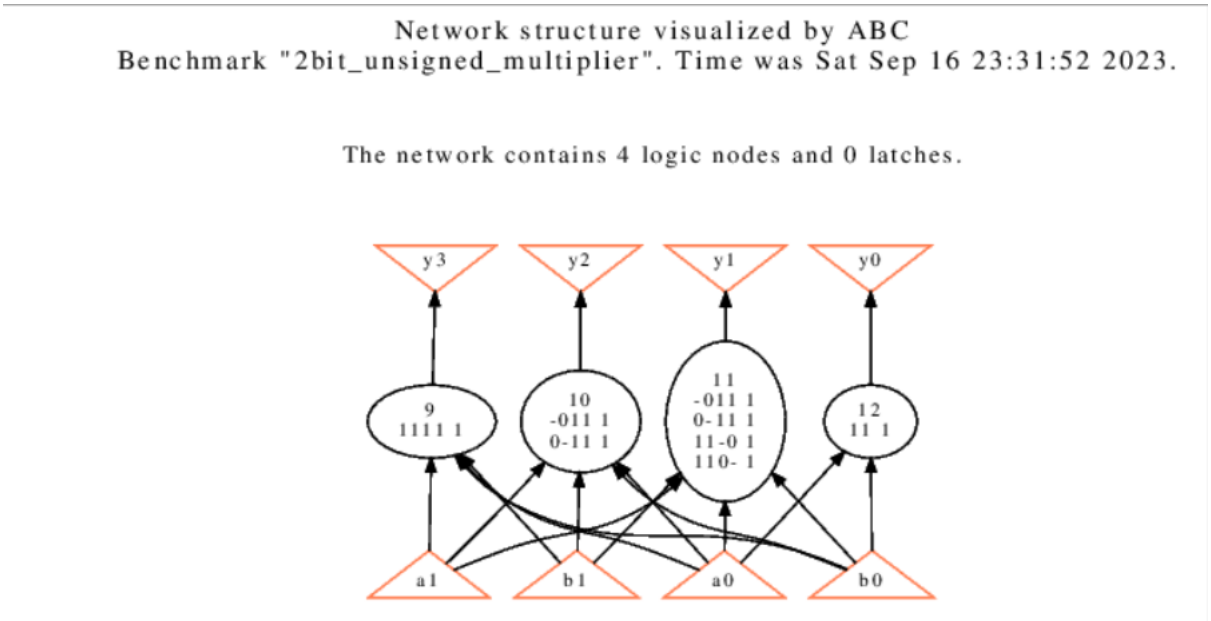
- Problem 3

(a) Continues from the Problem 2

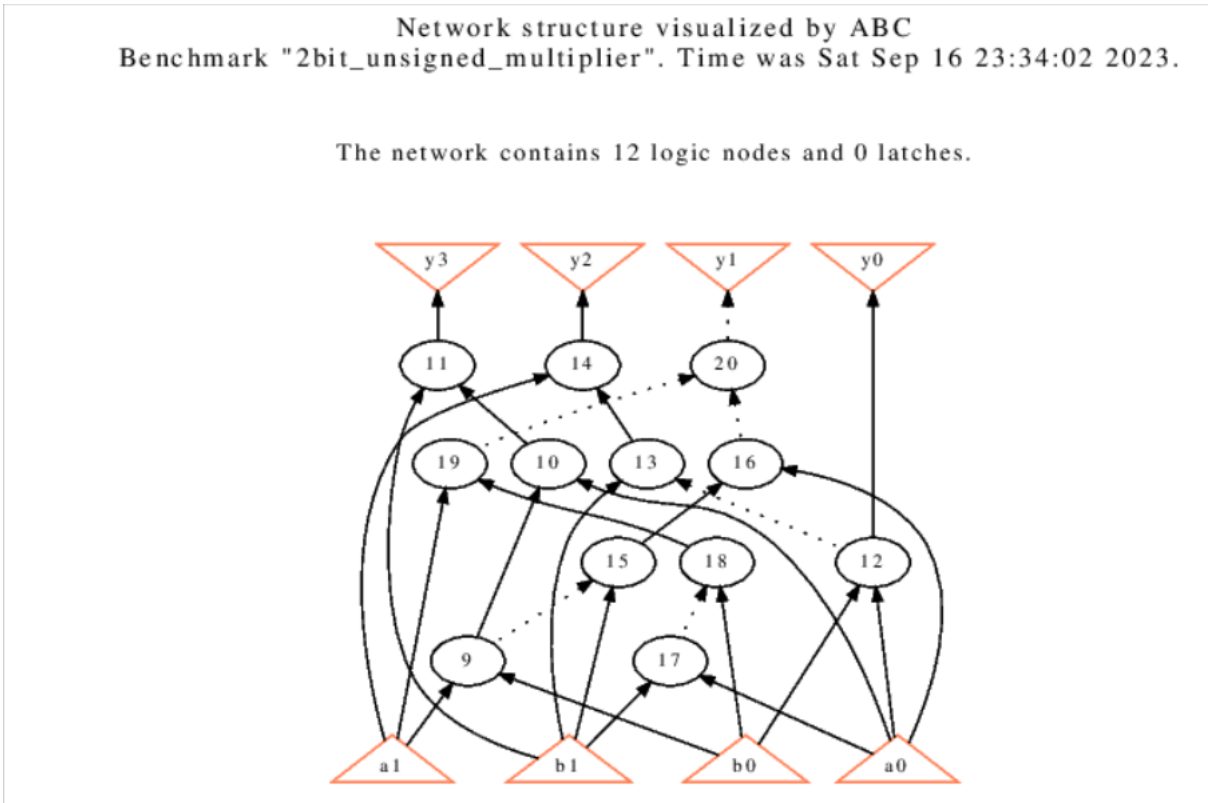
1. aig v.s. strash

```
abc 04> aig
Error: The logic network is already in the AIG form.
abc 04> show
abc 04> Warning: Missing charsets in String to FontSet conversion

abc 04> strash
abc 05> show
abc 05> Warning: Missing charsets in String to FontSet conversion

abc 05>
```

aig :



strash :

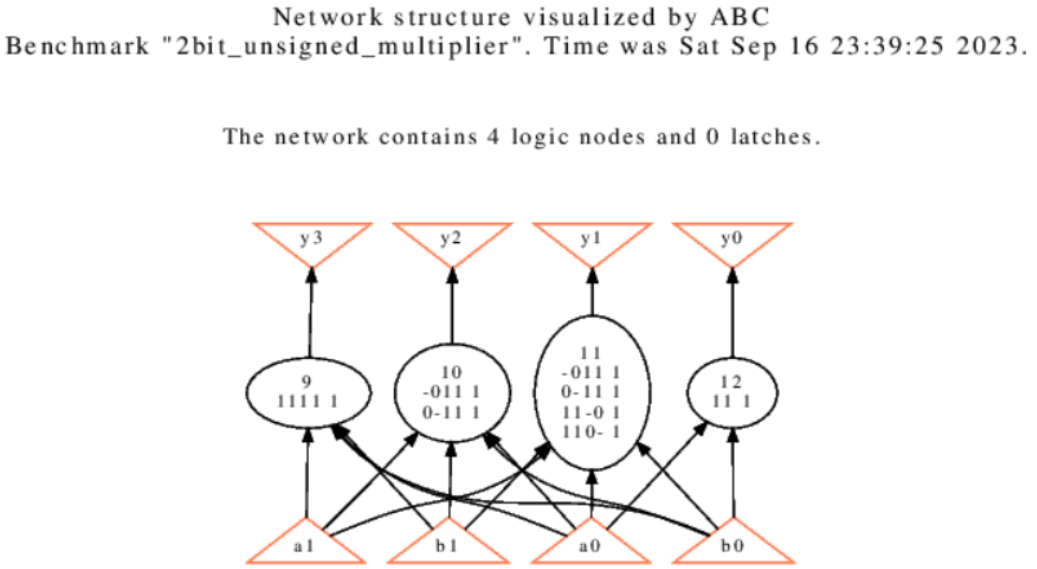


The difference is that the aig command is used in a logic network. The node is the logic function in AIG form (In this case, there are 4 nodes). The strash command converts the logic network to an AIG, with nodes being AND gates.

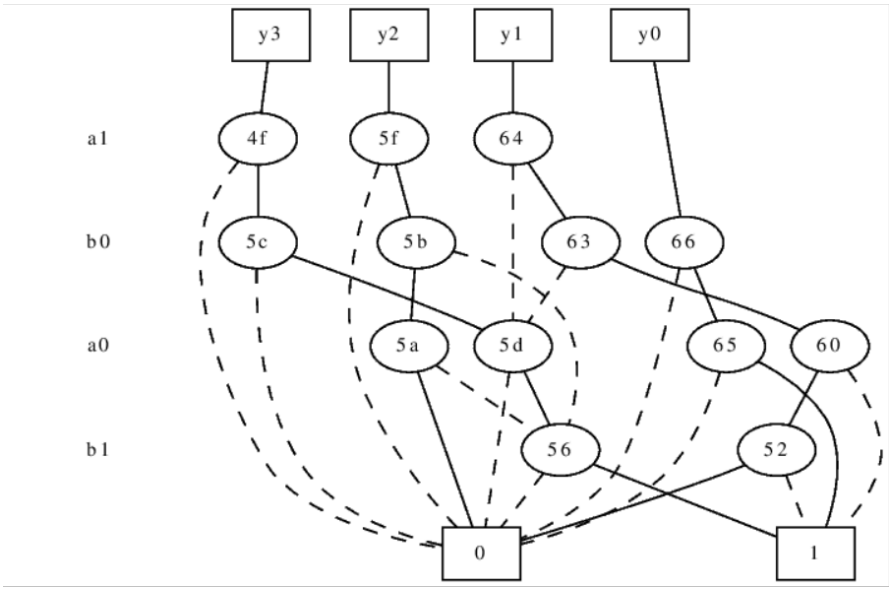
2. bdd v.s. collapse

```
abc 05> bdd
Error: Converting to BDD is possible only for logic networks.
abc 05> collapse
abc 06> show_bdd -g
abc 06> Warning: Missing charsets in String to FontSet conversion

abc 06> aig
Error: The logic network is already in the AIG form.
abc 06> bdd
abc 06> show_bdd -g
abc 06> Warning: Missing charsets in String to FontSet conversion

abc 06> show
abc 06> Warning: Missing charsets in String to FontSet conversion
```

bdd (show):



collapse (show_bdd) :

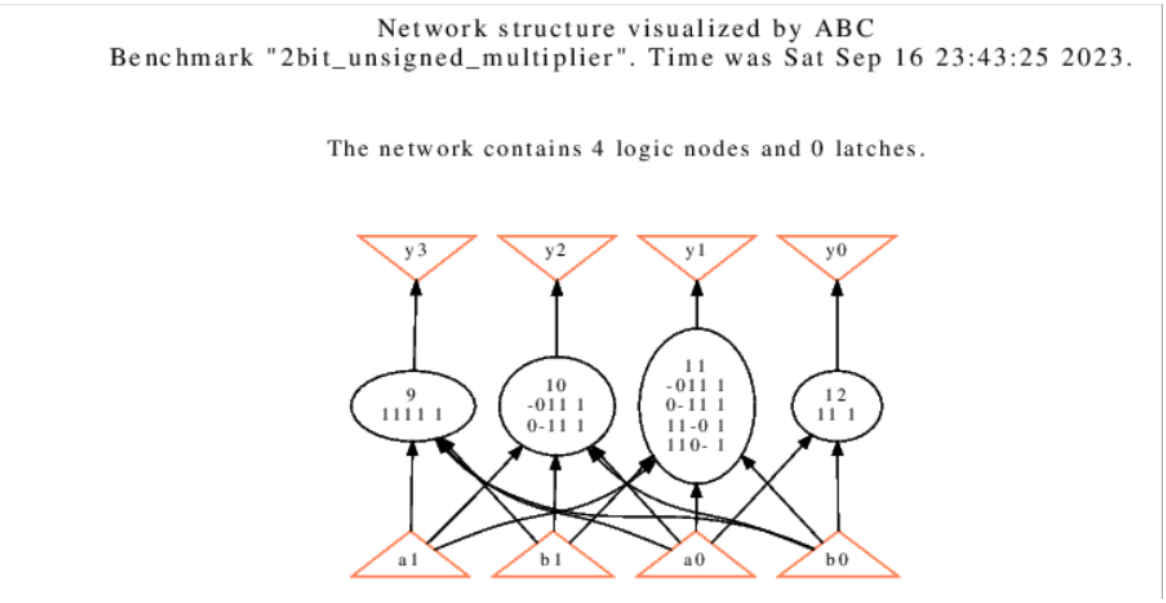


The difference is in fact the way we show the network (show v.s. show_bdd). The collapse command converts the original logic network to the logic network with every node being a global function. Since the function is in BDD form, the bdd command does nothing on the network, hence they are the same. (looks like the same when using the same show command)

(b)

Use the command “collapse” then “sop”.

```
abc 06> strash
abc 07> collapse
abc 08> sop
abc 08> show
abc 08> Warning: Missing charsets in String to FontSet conversion

abc 08>
```



Another way is to use the command “logic”.

```
abc 08> strash
abc 09> logic
abc 10> show
abc 10> Warning: Missing charsets in String to FontSet conversion

abc 10>
```

Network structure visualized by ABC
Benchmark "2bit_unsigned_multiplier". Time was Sat Sep 16 23:46:23 2023.

The network contains 12 logic nodes and 0 latches.