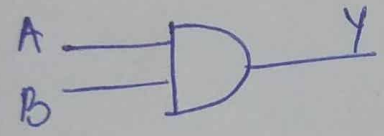
Fault Detection & Location

Faults
- stuck-at-0 (s-a-0)
- stuck-at-1 (s-a-1)

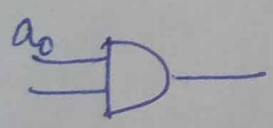
Non-detectable
Detectable (if by any test we can check whether the ckt is working correctly or not)
- single
- multiple

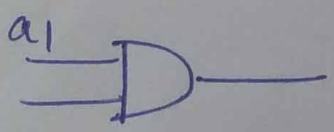


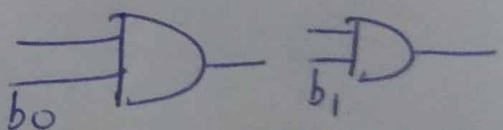
Test	A	B	Y
0 →	0	0	0
1 →	0	1	0
2 →	1	0	0
3 →	1	1	1

s-a-0 at A & B for Test '0' is undetectable. Also for tests '1' & '2' whereas for Test '3', s-a-0 fault for A & B is detectable.

a_0, b_0 is detectable at {11}







Y = 0 (Correct)
Y ⇒ can be faulty

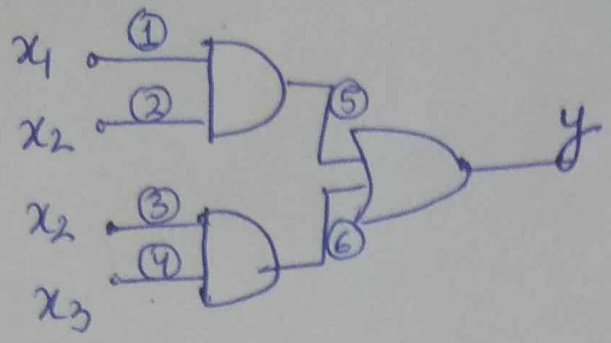
Illy C_0, C_1.

A	B	Y (correct)	Y_{a_0}	Y_{a_1}	Y_{b_0}	Y_{b_1}	Y_{C_0}	Y_{C_1}
0	0	0	0	0	0	0	0	(1)
0	1	0	0	(1)	0	0	0	(1)
1	0	0	0	0	0	(1)	0	(1)
1	1	1	(0)	1	(0)	1	(0)	1

Test {0} for C_1, Test {1} for a_1, C_1
Test {2} for b_1, C_1, Test {3} for a_0, b_0, C_0
Total Test set = {1, 2, 3}

Det Test set using fault Table method

$Y = x_1x_2 + x_2x_3$



Test set for Fault detection is {2, 3, 5, 6}

Test	x_1	x_2	x_3	f_0	f_{10}	f_{11}	f_{20}	f_{21}	f_{30}	f_{31}	f_{40}	f_{41}	f_{50}	f_{51}	f_{60}	f_{61}
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	1
2	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	1
3	0	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1
4	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
5	1	0	1	0	0	0	0	1	0	1	0	0	0	1	0	1
6	1	1	0	1	0	1	0	1	1	1	1	1	0	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

6 unique O/Ps for all faults.

f_0 = fault-free

$f_1 = \{f_{10}, f_{20}, f_{50}\}$

$f_2 = \{f_{11}, f_{41}\}$

$f_3 = \{f_{21}\}$

$f_4 = \{f_{30}, f_{40}, f_{60}\}$

$f_5 = \{f_{31}\}$

$f_6 = \{f_{50}, f_{61}\}$

Test \ Fault	01	02	03	04	05	06
0						1
1					1	1
*2	1					1
*3				1		
4			1			1
5			1		1	1
*6	1					
7						

Fault detection table

Fault is detectable if $f_0 \oplus f_{faulty} = 1$

01 means $f_0 \oplus f_1$, 02 means $f_0 \oplus f_2$ and so on.

Essential Table = {2, 3, 6} covering cols 01, 02, 04 & 06.

Cols 03 & 05 are covered by Test {5}

Fault location using Fault Table method:

Test {2} = $f_2, f_6 = f_{11}, f_{41}, f_{51}, f_{61}$ → s-a-1 faults

{3} = $f_4 = f_{30}, f_{40}, f_{60}$

{5} = $f_3, f_5 = f_{21}, f_{31}$ → s-a-0 faults

{6} = $f_1 = f_{10}, f_{20}, f_{50}$

Faults are not distinguishable. So, there is a need for fault location table.

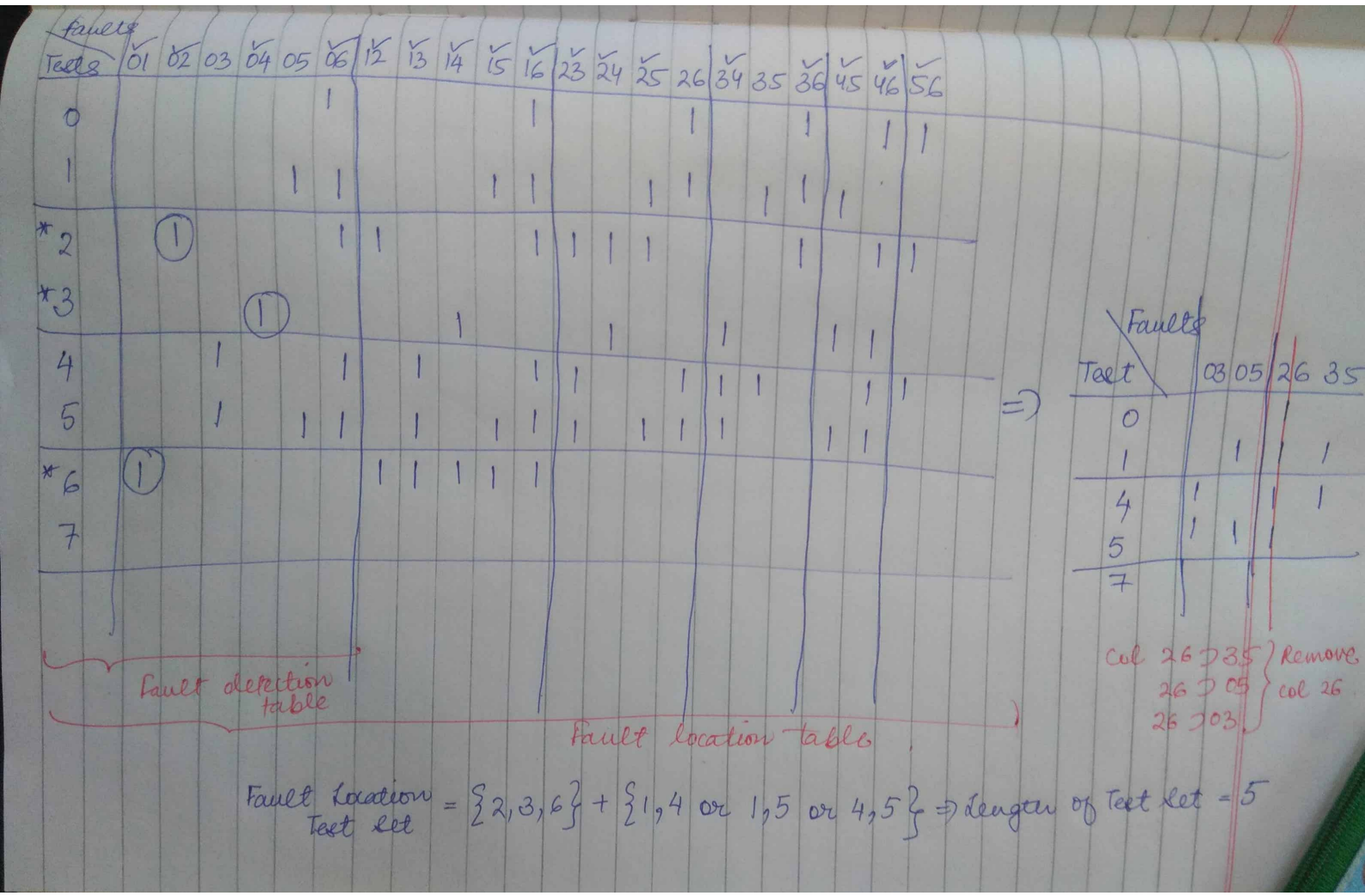
Fault location Test set = {2,3,6} + {1,4 or 1,5 or 4,5}

choice of Tests is independent of outcome of each test.

(Fixed schedule Fault detection & location)

Adaptive-Scheduled Fault detection & location :—

- Order in which tests are performed is variable (depending upon which fault needs to be checked)
  For fixed-schedule, length of test set = fixed (eg: 5)
  " adaptive " " " " = Variable (eg: ≤5)
- Use a Diagnosing tree (directed graph whose nodes are tests & outgoing branches represent different outcomes of a particular test).



Fault Location Test set = {2,3,6} + {1,4 or 1,5 or 4,5} ⇒ Length of Test set = 5