

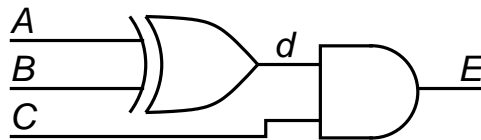
Spring 2008  
 TESTING OF  
 ULTRA LARGE SCALE INTEGRATED CIRCUITS  
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Homework 13 – Corrected  
 Assigned April 25, 2008 – Due May 9, 2008

Reading Assignment: Chapters 18 & 19

## 1 System Test and Core-Based Design

18.10 *Fault dictionary.* Diagnose the circuit of Figure 1 using the fault dictionary of Table 1 when a multiple fault ( $a_1, c_0$ ) has occurred.



Test Vectors for Problem 18.10.

|       | $A$ | $B$ | $C$ |
|-------|-----|-----|-----|
| $t_1$ | 1   | 0   | 1   |
| $t_2$ | 0   | 0   | 1   |
| $t_3$ | 0   | 1   | 1   |
| $t_4$ | 1   | 0   | 0   |

Figure 1: Circuit for Problem 18.10.

Table 1: Fault Dictionary for Figure 1.

| Fault           | Test Syndrome |       |       |       |
|-----------------|---------------|-------|-------|-------|
|                 | $t_1$         | $t_2$ | $t_3$ | $t_4$ |
| $a_0$           | 1             | 0     | 0     | 0     |
| $a_1$           | 0             | 1     | 1     | 0     |
| $d_1$           | 0             | 1     | 0     | 0     |
| $b_0$           | 0             | 0     | 1     | 0     |
| $b_1$           | 1             | 1     | 0     | 0     |
| $c_0, d_0, e_0$ | 1             | 0     | 1     | 0     |
| $c_1$           | 0             | 0     | 0     | 1     |
| $e_1$           | 0             | 1     | 0     | 1     |

18.11 *Diagnosis.* Diagnose the circuit of Figure 1 using the diagnostic tree of Figure 2 when a multiple fault  $(a_1, b_1)$  has occurred.

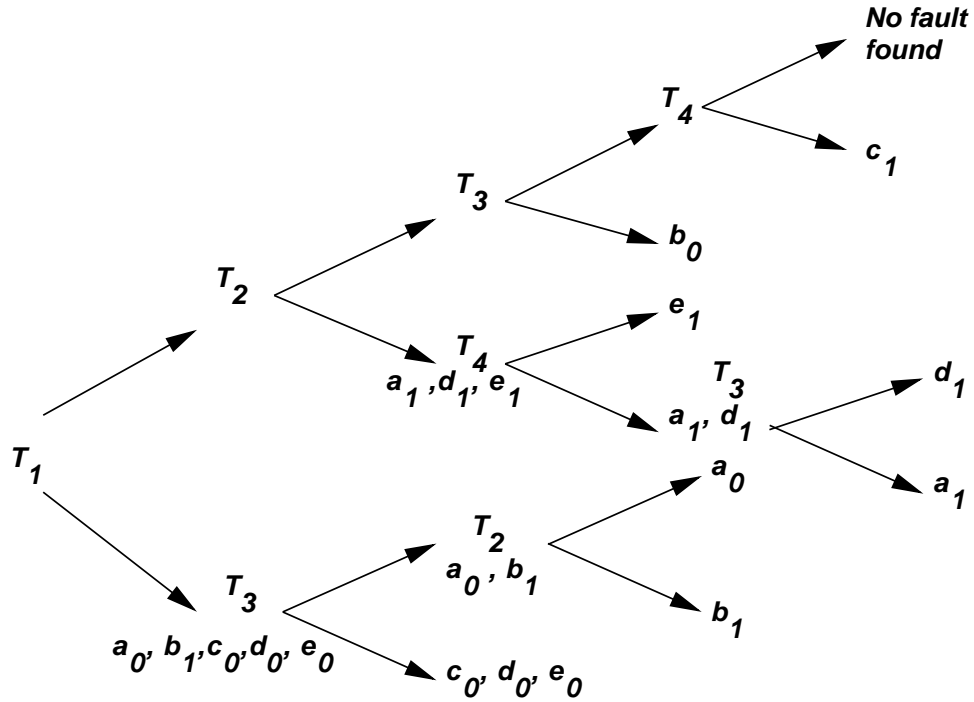


Figure 2: Fault diagnostic tree for Figure 1.

18.12 *Fault dictionary.* Create a fault dictionary for single stuck-at faults in the circuit of Figure 3.

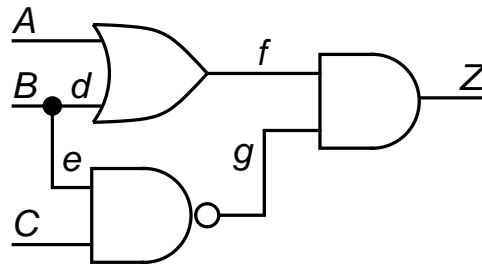


Figure 3: Circuit for Problems 18.12 and 18.13.

18.13 *Diagnostic fault tree.* Create a diagnostic fault tree for the circuit of Figure 3.

18.14 *Diagnosis.* Redesign the diagnostic tree for the circuit of Figure 1 to minimize the average time of diagnosis for the fault occurrence probabilities  $Prob(a_1) = 0.25$ ,  $Prob(b_1) = 0.25$ ,  $Prob(c_0) = 0.25$ ,  $Prob(e_0) = 0.10$ , and all other faults are never found to occur. Find the average number of tests to diagnose the circuit using the diagnostic tree of Figure 2, and compute the average number of tests to diagnose the circuit using your diagnostic tree, instead.