

The University of Alabama in Huntsville
ECE Department
CPE 628 01
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Homework #6 Solution

- 10.3 Assume that a 4-bit INTEST instruction is loaded into the instruction register of a boundary-scan architecture and the TAP is in the Select-DR-Scan state. Now you are going to apply 100 patterns to the internal logic and observe the test results. If the length of the boundary register is 30, then how many test cycles will be required to carry out the entire test procedure? Assume that the internal logic is a combinational circuit and that after the test procedure the circuit will return to the Test-Logic-Reset state.

Assume the number of input wrapper cells equals that of output wrapper cells. The number of required test cycles to apply test patterns and propagate test responses is calculated as follows.

The number of required test cycles to apply a test pattern is 1 (to *Capture-DR*) + 1 (to *Shift-DR*)*15 + 1 (to *Exit1-DR*) + 1 (to *Update-DR*) + 1 (to *Select-DR-Scan*) = 19

The number of required test cycles to observe test responses is 1 (to *Capture-DR*) + 1 (to *Shift-DR*)*15 + 1 (to *Exit1-DR*) + 1 (to *Update-DR*) + 1 (to *Select-DR-Scan*) = 19

Note that after the first test pattern is applied, applying test patterns and propagating test responses can be executed simultaneously. Therefore, the number of required test cycles to apply test patterns and propagate test responses will be 19 (applying the first test pattern) + 19*99 (applying test patterns and propagating test responses) + 19 (propagating the last test responses) + 1 (to *Select-IR-Scan*) + 1 (to *Test-Logic-Reset*) = 1921.

- 10.11 Similar to 10.3, assume now that the internal logic is wrapped by a 1500 wrapper. How many test cycles are required to load the instruction and execute the scan operation using WSP only?

Assume the numbers of input wrapper cells and output wrapper cells are equal. Then the number of required test cycles can be calculated as follows: 4 (*loading instruction*) + (15+1) (15-*shift in the first test pattern to the wrapper chain and 1-apply to the circuit*) + (15+1)*99 (*shift in the remaining test patterns to the wrapper chain and apply to the circuit as well as capture the test response and shift out the test responses*) + 15 (*shift out the test response associated with the last test pattern*) = 1619 (cycles)