MITOCW | MIT6_004S17_04-02-08-03_300k

We are given the combinational circuit shown here consisting of an inverter, an AND gate, an exclusive OR gate, and a multiplexor.

We are also provided with the contamination and propagation delays for each of the components in the circuit.

We are then asked to determine the contamination delay and propagation delay for the entire circuit.

The propagation delay of a circuit is defined as the longest delay that can occur from when the inputs changed to when the output becomes stable.

In order to calculate the propagation delay of a circuit, we need to identify the path from input to output whose sum of the propagation delays is the largest.

For this circuit, the longest delay path is through the exclusive or gate and the multiplexor.

The sum of the propagation delay across these 2 gates is 2.1 + 1.5 = 3.6 ns.

The contamination delay of a circuit is defined as the shortest delay from when the inputs change to when the outputs begin to change, or when the outputs are no longer guaranteed to be holding their previous stable value.

In order to calculate the contamination delay, we find the path whose sum of the contamination delays is the least.

For this circuit, the shortest path is from input A through the selector of the multiplexor.

So the contamination delay for this circuit is equal to the contamination delay of the multiplexor which equals 0.2 ns.