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Tutorial : Combinational Timing

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Combinational Timing

1/1 point (ungraded)

Is it possible for an inverter to have a contamination delay that is greater than its propagation delay?

☐ Yes

☒ No

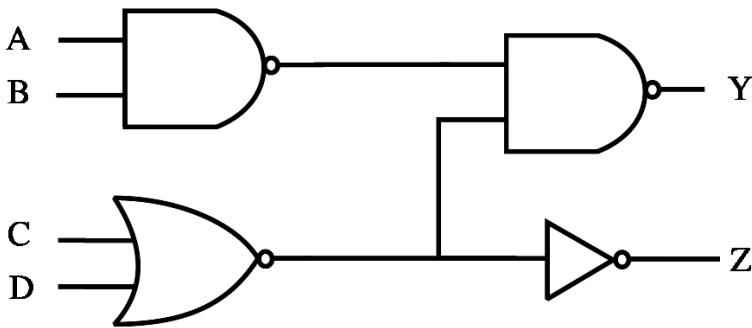
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Combinational Timing

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Here's a table showing the t_{CD} and t_{PD} for each of the components in the circuit above. Please compute t_{CD} and t_{PD} for the circuit as a whole.

	t_{CD}	t_{PD}
Inverter	0 ns	4 ns
NAND	1 ns	8 ns
NOR	4 ns	10 ns

Contamination delay (ns): ❌

Propagation delay (ns): ✅

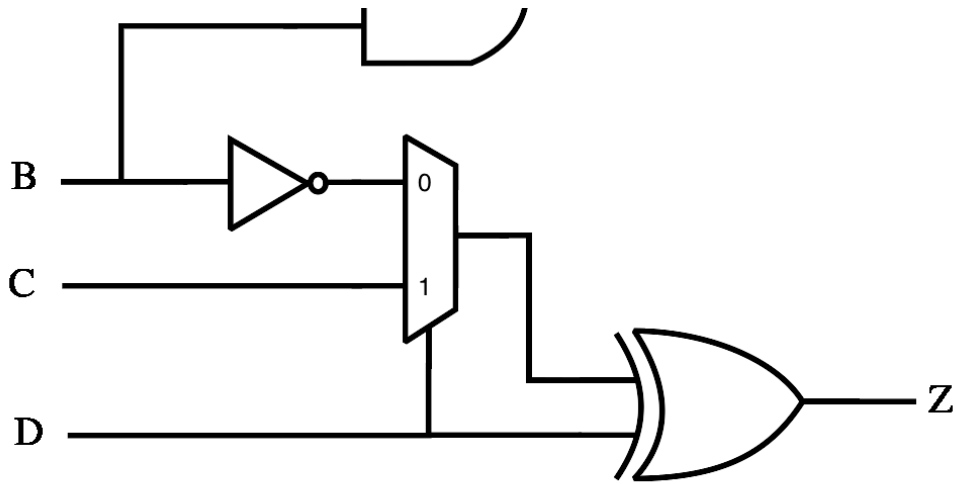
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Combinational Timing

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Calculator



Here's a table showing the t_{CD} and t_{PD} for each of the components in the circuit above. Please compute t_{CD} and t_{PD} for the circuit as a whole.

	t_{CD}	t_{PD}
Inverter	0.1 ns	0.7 ns
AND2	0.3 ns	0.7 ns
XOR2	0.4 ns	2.2 ns
MUX2	0.1 ns	1.0 ns

t_{CD} (ns):

✓ Answer: 0.3

t_{PD} (ns):

✗ Answer: 3.9000000000000004

Explanation

The contamination delay of the circuit as a whole is the contamination delay of the shortest path through the circuit. In this case this path is either from the A input through the and gate to Y, or from D through the xor gate to Z. To find the contamination delay of the circuit find the smallest of the two paths. The path from A has $t_{CD} = 0.3ns$ and the path from D has $t_{CD} = 0.4ns$. So the contamination delay for the circuit is **0.3ns**.

The propagation delay of the circuit as a whole is the propagation delay of the longest path through the circuit in terms of propagation delays. In this case this will either be the path from A and B through the and gate to Y or the path from B through the inverter, the mux and the xor to Z. To find the propagation delay we have to add the propagation delay along each path and take the largest. The path from A and B to Y has $t_{PD} = 0.7ns$. The path from B to Z has $t_{PD} = 0.7 + 1.0 + 2.2ns$. So the answer is the longer of the two, which is **3.9000000000000004ns**.

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Answers are displayed within the problem

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- [STAFF] there is no E in 2nd graph!
Also too many paragraphs in the answer to 2nd circuit. It is a simple concept 2 paragraphs should be enough

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- Combinational Timing Part 1

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Calculator



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