

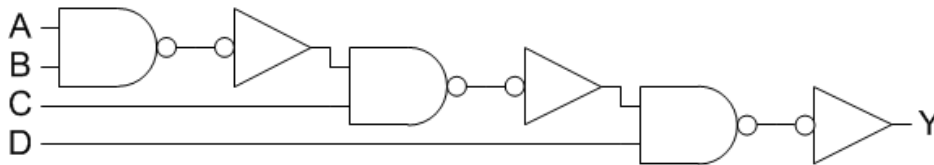
E85: Digital Design and Computer Engineering

Problem Set 3

- 1) Suppose propagation delays for a 10-nm integrated circuit process are given in the table below.

Cell	Propagation Delay (ps)	Contamination Delay (ps)
NOT	6	4
NAND2	8	6
NOR2	10	8
NAND3	10	8
NOR3	12	10

Determine the propagation and contamination delays of the following circuit. Redesign it to accomplish the same function while minimizing propagation delay, using only gates from the table above. What are the propagation and contamination delays of your optimized circuit?



- 2) Latches and Flip-Flops

Do Exercises 3.4 and 3.6 from the textbook.

- 3) Combinational and Sequential Logic

Do Exercise 3.18 from the textbook.

- 4) FSM design

Do Exercise 3.26 from the textbook. Just sketch the state transition diagram. Don't draw a schematic.

- 5) Impact on society: Name a system (other than a traffic light or soda machine dispenser) that you encounter in daily life that is readily described as a finite state machine.

- 6) AI Question (Optional)

This question must be solved by AI. Report what the AI produces, whether you believe it is accurate or a hallucination, and whether the solution is similar, better, or worse than what you would have done yourself in a reasonable amount of time.

- a) Ben has a chain of 15 2-input AND gates to compute a 16-input AND function. Each gate has a 10 ps propagation delay. What is the overall propagation delay?
- b) How could Ben make the circuit faster?

How long did you spend on this problem set? This will not count toward your grade but will help calibrate the workload.