Problem 1. (20 points) Design the following Boolean function using pseudo-NMOS and dynamic logic.

\[
\text{Out} = \text{NOT}(A \land (B \lor C \lor D))
\]

Problem 2. (20 points) Design the following Boolean function using domino logic and DCVSL logic. For DCVSL, indicate the output that matches the specified function.

\[
\text{Out} = A \lor B \lor (C \land D \land E)
\]

Problem 3. (40 points) Consider the following two implementation of a domino logic gate:

Assume that the A and B inputs are driven by another domino logic circuit. First, consider Implementation A. What logic function does this gate perform? There is a substantial problem with this circuit. Describe the problem and the potential symptoms of the problem.

Implementation B replaces the inverter on the inputs with another circuit. Somehow, this circuit prevents the problem with Implementation A. Determine the truth table of the function in the mystery box that assures proper domino logic operation.
Problem 4. (20 points) Assume an inverter driving a given load $C_L$, with a supply voltage of $V_{DD}$, and running at a frequency $f$, consumes power $P$ and has a delay of $D$. By reducing the power supply by a ratio $v$ from the original, the inverter’s delay is proportional to $\frac{v}{v - 0.25}$. If the inverter has negligible static power consumption (100% dynamic power consumption), what ratio $v$ optimizes power-delay-product?