1. (10 points) Consider the following functions

\[
\begin{align*}
f(a, b, c, d) &= a \overline{b} c + \overline{b} c + ac + \overline{a} \overline{b} c \overline{d} \\
g(a, b, c, d) &= ab + \overline{a} bc \overline{d} \\
h(a, b, c, d) &= \overline{a} \overline{b} c \overline{d} + \overline{a} bc \overline{d}
\end{align*}
\]

(a) Draw a diagram for an implementation using a single PLA using a minimal number of AND gates. How many AND gates are required?

(b) If you were to implement it with a PAL, how many AND gates would be required?

2. (10 points) Implement \( f(a, b, c) = \sum(0, 3, 4) + d(2, 5, 7) \) using a \( n:1 \) multiplexor where \( n \) is minimal. Draw the circuit diagram. What is \( n \)?
3. **(10 points)** Reimplement the following network using only NANDs and NORs. Assume there is no cost to invert inputs. You need not globally reorganize the network: local transformation is sufficient. Show a series of three or so circuit diagrams indicating your steps.

4. **(5 points)** Implement an exclusive or gate using steering logic. Assume access to complimented and uncomplimented input literals. Draw a diagram composed only of transmission gates. How many transmission gates are required?

5. **(5 points)** Implement an exclusive or using transmission gates. Assume access to complimented and uncomplimented input literals. Draw a diagram composed only of transmission gates. How many transmission gates are required?