

Sample Midterm Examination

There are five questions. Be precise, show every step, and state your assumptions (if any), to get full credit.

1. Use the Quine-McClusky method to find the minimized product of sums expression for the function $F(A, B, C) = A \oplus B \oplus C$.
2. Implement the minimized form of the following logic expression.

$$F(A, B, C, D) = \sum m(1, 5, 6, 9, 11, 13)$$

- (a) Use a two-level NAND-NAND gate network.
 - (b) Use a two-level NOR-NOR gate network.
 - (c) Which implementation is better?
3. Implement a 1-bit full adder by two 4:1 multiplexers. You may assume that all inputs and their complements are available.
 4. Implement the following function by

$$F(A, B, C, D) = \bar{A}BC + AD + AC$$

- (a) A 4:16 decoder with a 16-input OR gate;
 - (b) A 16-word ROM;
 - (c) A PLA.
5. Design a 4-bit circuit that can perform either BCD or binary addition under the control of a mode setting, M . When $M = 0$, the circuit's outputs implement binary addition. When $M = 1$, the output are BCD addition.