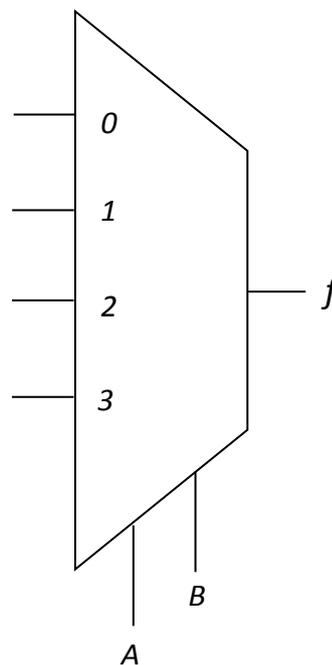


Logic design (2017 fall)

Quiz # 9

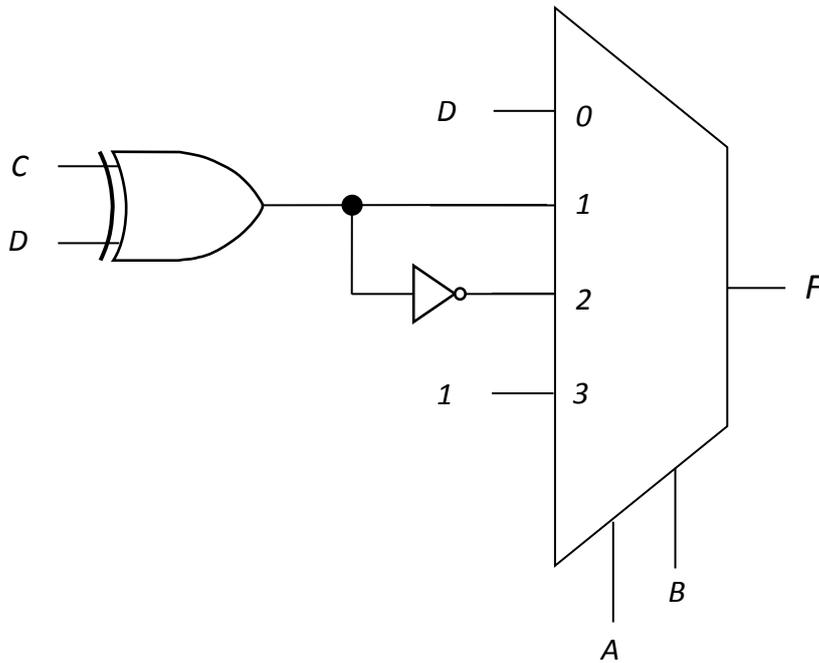
Name: _____ ID: _____

1. (40%) Realize the function $F(A,B,C,D) = A'B'D + ABC' + ABD + B'CD + BCD' + A'BC'D + AB'C'D'$ using only a XOR gate, a NOT gate and a 4-to-1 multiplexer with A and B as the select inputs where A is the most significant bit and B is the least significant bit. Note that complement inputs are not allowed.



Ans:

$$\begin{aligned}
 F(A,B,C,D) &= A'B'D + ABC' + ABD + B'CD + BCD' + A'BC'D + AB'C'D' \\
 &= A'B' \cdot (D + CD) + A'B \cdot (CD' + C'D) + AB' \cdot (CD + C'D') + AB \cdot (C' + D + CD') \\
 &= A'B' \cdot (D) + A'B \cdot (C \oplus D) + AB' \cdot (C \equiv D) + AB \cdot (1)
 \end{aligned}$$



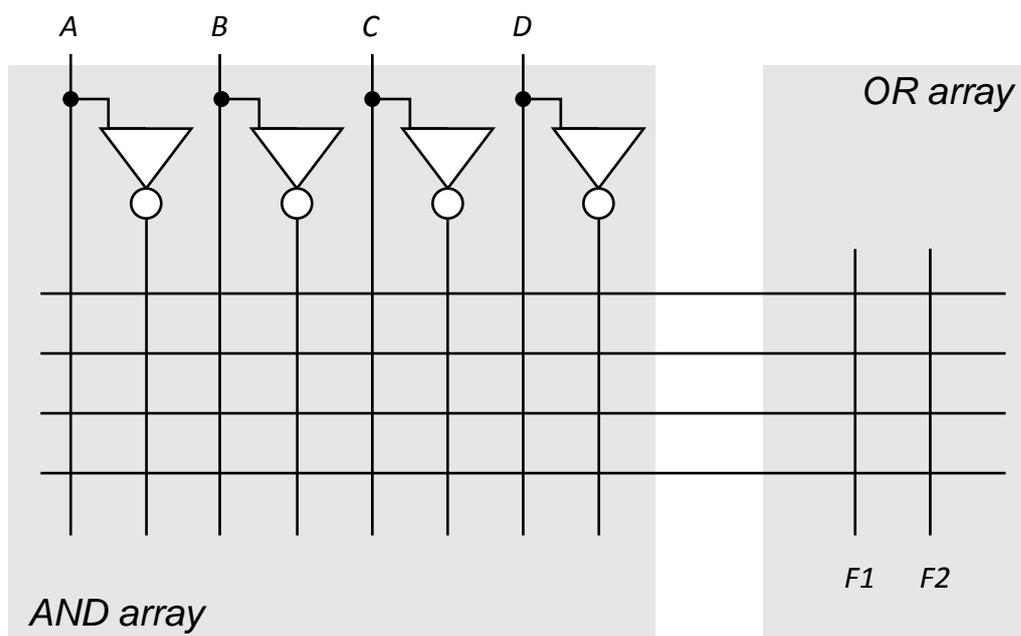
2. (60%) Implement the following equations using the PLA with four product terms only.

$$F1(A,B,C,D) = \prod M(1, 3, 6, 9, 11, 13, 14, 15)$$

$$F2(A,B,C,D) = \prod M(0, 1, 3, 4, 6, 8, 9, 11)$$

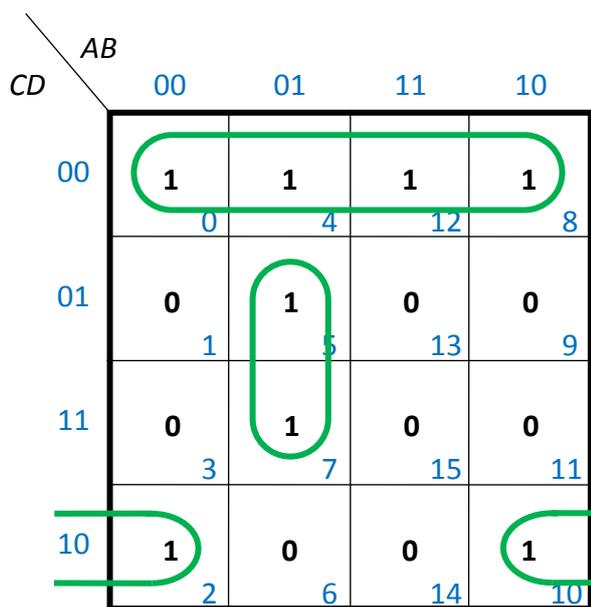
(a) (40%) List the four product terms used in the PLA

(b) (20%) Following shows the PLA structure, of which left and right side are AND array and OR array respectively. The intersection of a row and input or output lines indicates the presence of a switching element in the array. Indicate the connections which will be made to program the PLA

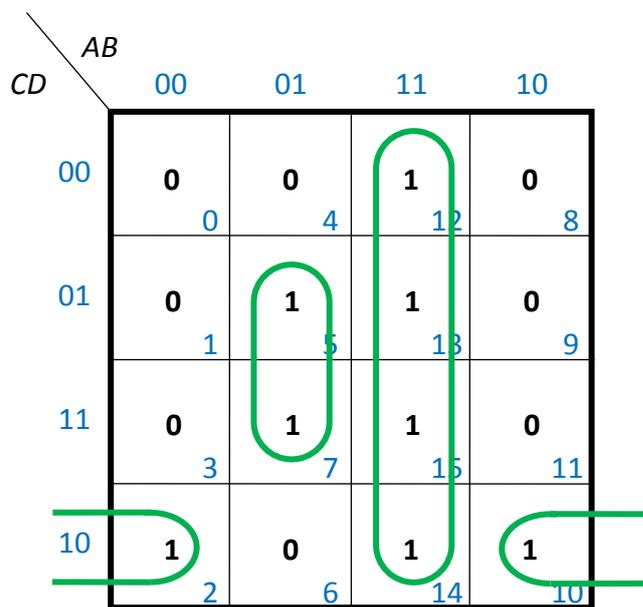


Ans:

(a)



$$F1 = C'D' + A'BD + B'CD'$$



$$F2 = AB + A'BD + B'CD'$$

(b)

