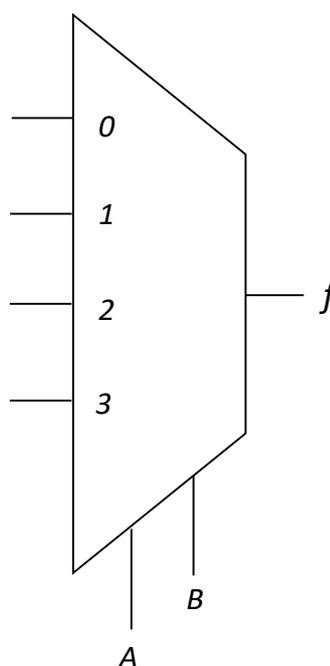


Logic design (2018 fall)

Quiz # 9

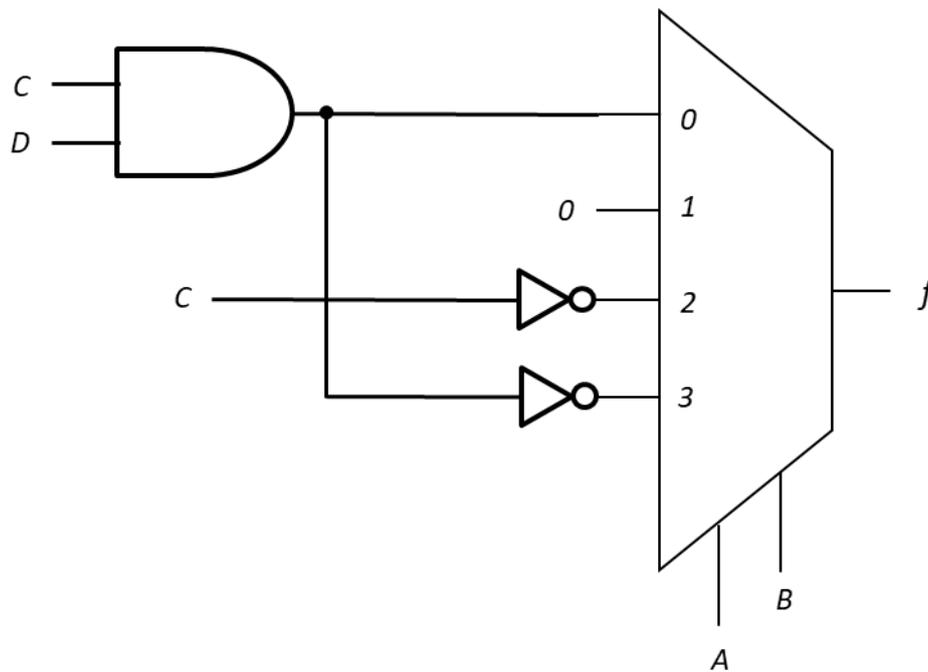
Name: _____ ID: _____

1. (40%) Realize the function $F(A,B,C,D) = AB'C' + ABC'D + ABD' + A'B'CD + ABC'D'$ using only a AND gate, two NOT gates 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:

$$F(A,B,C,D) = AB'C' + ABC'D + ABD' + A'B'CD + ABC'D'$$
$$= A'B' \cdot (CD) + A'B \cdot (0) + AB' \cdot C' + AB \cdot (C' + D')$$



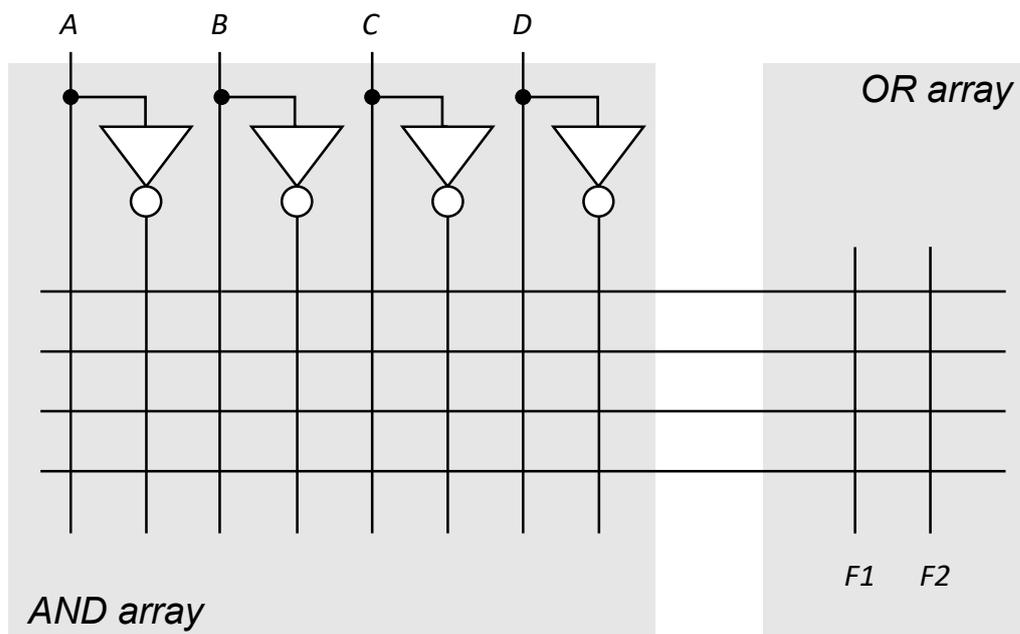
2. (60%) Implement the following equations using the PLA with four product terms only.

$$F1(A,B,C,D) = \prod M(3, 5, 7, 11, 12, 13, 14, 15)$$

$$F2(A,B,C,D) = \prod M(0, 2, 3, 6, 7, 11, 14, 15)$$

(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)

CD \ AB	00	01	11	10
00	1	1	0	1
01	1	0	0	1
11	0	0	0	0
10	1	1	0	1

$$F1 = A'D' + AB'D' + B'C'D$$

CD \ AB	00	01	11	10
00	0	1	1	1
01	1	1	1	1
11	0	0	0	0
10	0	0	0	1

$$F2 = BC' + AB'D' + B'C'D$$

(b)

