Homework3

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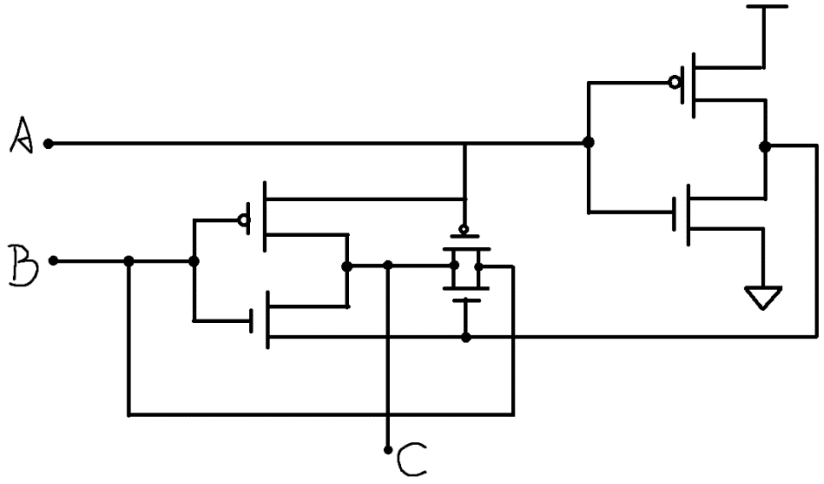
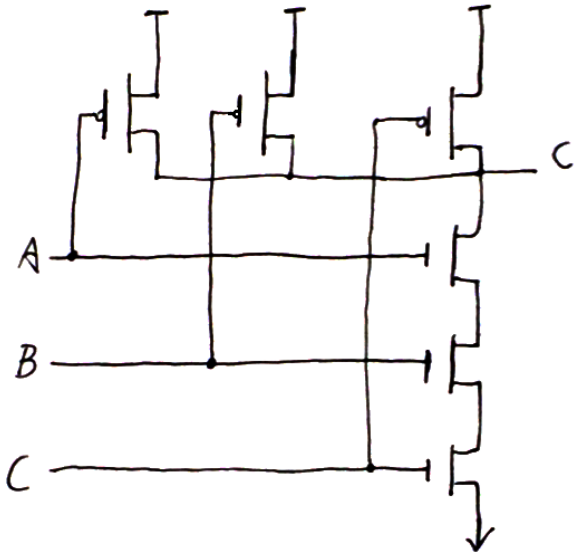
1.

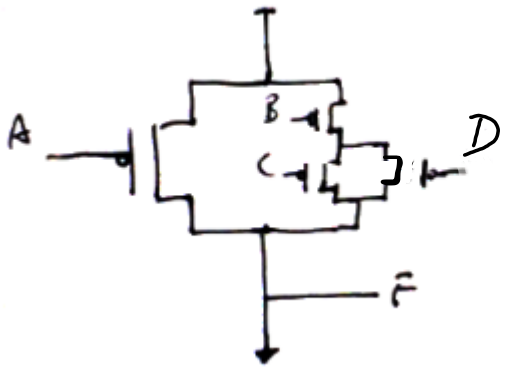
a. XOR




b. NAND



c. $F = (A \cdot (B + CD))'$




2.

a.
$xyz + x'y + xyz'$
$= y(xz + x' + xz')$
$= y(x' + x(z + z'))$
$= y(x' + x \cdot T)$
$= y(x' + x)$
$= y \cdot T$
$= y$

b.
$(x + y)' \cdot (x' + y')$
$= (x' \cdot y') \cdot (x' + y')$
$= (x' \cdot y' \cdot x') + (x' \cdot y' \cdot y')$
$= (x' \cdot y') + (x' \cdot y')$
$= x' \cdot y'$

c.
$A'C' + ABC + AC'$
$= (A'C' + AC') + ABC$
$= (C' \cdot (A' + A)) + ABC$
$= (C' \cdot T) + ABC$
$= C' + ABC$

d.
$(A + B)' \cdot (A' + B')'$
$= (A' \cdot B') \cdot (A \cdot B)$
$= F$

3.

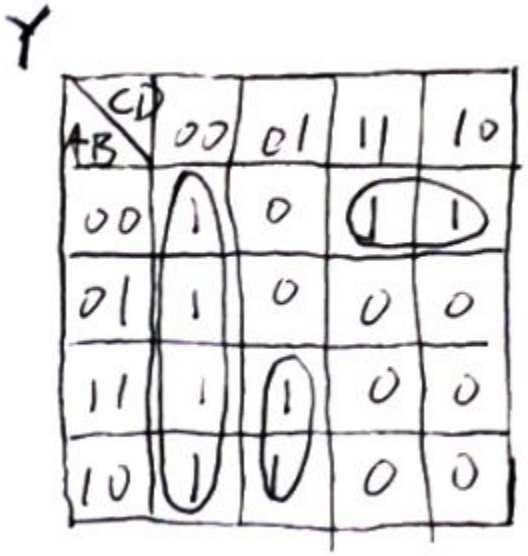
1) Output:

$F = B'C'D' + A'B'C + AC'D + BC'D' + A'B'CD'$

| # | A | B | C | D | Output |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 2 | 0 | 0 | 1 | 0 | 1 |
| 3 | 0 | 0 | 1 | 1 | 1 |
| 4 | 0 | 1 | 0 | 0 | 1 |
| 5 | 0 | 1 | 0 | 1 | 0 |
| 6 | 0 | 1 | 1 | 0 | 0 |
| 7 | 0 | 1 | 1 | 1 | 0 |
| 8 | 1 | 0 | 0 | 0 | 1 |
| 9 | 1 | 0 | 0 | 1 | 1 |
| 10 | 1 | 0 | 1 | 0 | 0 |
| 11 | 1 | 0 | 1 | 1 | 0 |
| 12 | 1 | 1 | 0 | 0 | 1 |
| 13 | 1 | 1 | 0 | 1 | 1 |
| 14 | 1 | 1 | 1 | 0 | 0 |
| 15 | 1 | 1 | 1 | 1 | 0 |

$F(A, B, C, D) = \sum (0, 2, 3, 4, 8, 9, 12, 13)$

2) K-map



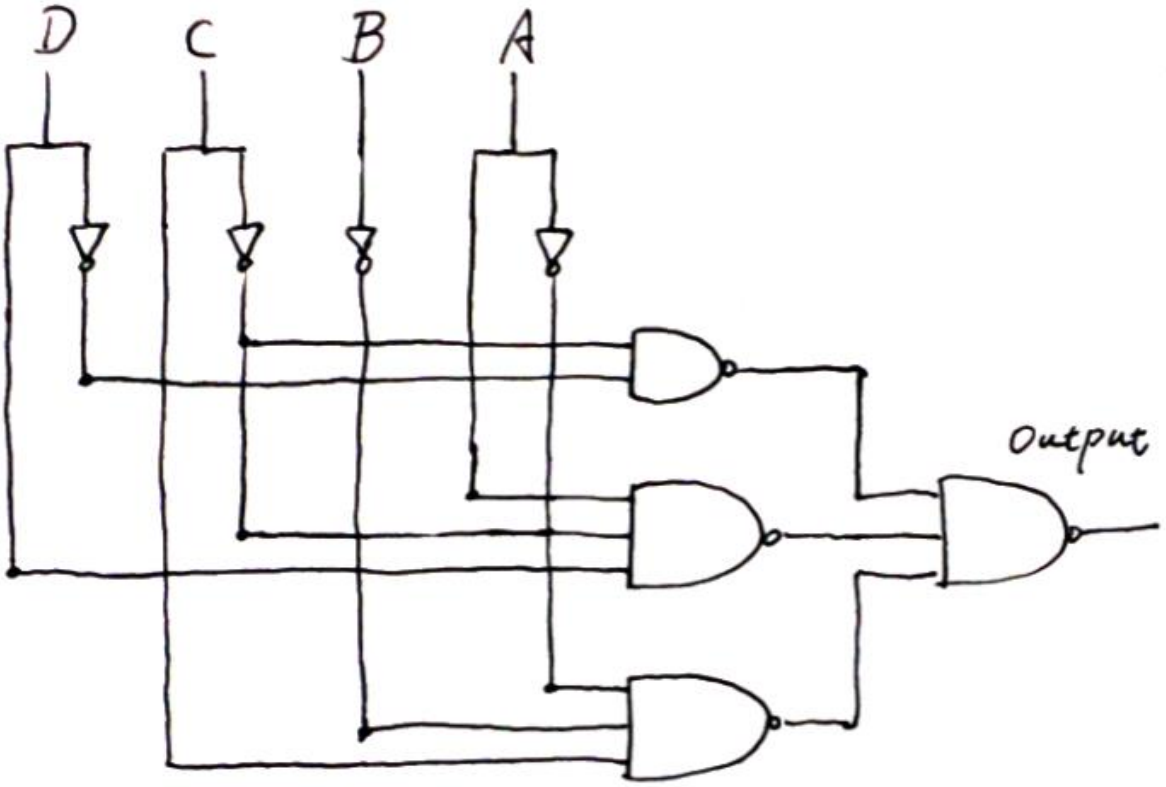

3) Minimized form

$Y = C'D' + AC'D + A'B'C$

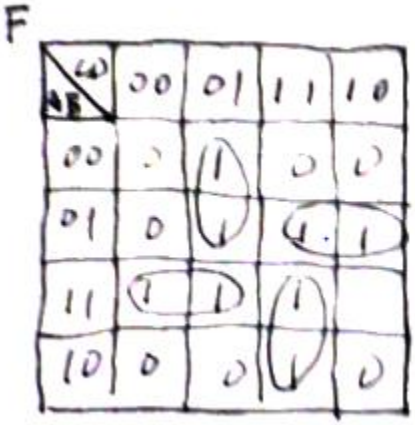
4) NAND form

Y = ((C'D')' (AC'D)' (A'B'C)')'

5) Circuit




4.




F = A'C'D + A'BC + ABC' + ACD

5.

A< B

| $A_0A_1 \setminus B_0B_1$ | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 1 | 1 | 1 |
| 01 | 0 | 0 | 1 | 1 |
| 11 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 1 | 0 |

$F_1 = A_0'B_0 + A_0'A_1'B_1 + A_1'B_0B_1$

A > B

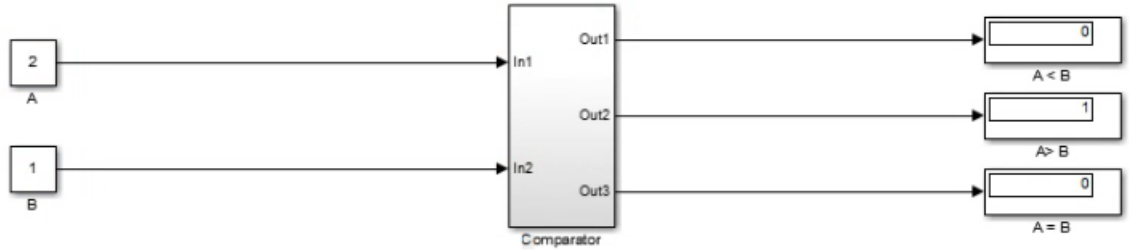
| $A_0A_1 \setminus B_0B_1$ | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 0 | 0 | 0 |
| 01 | 1 | 0 | 0 | 0 |
| 11 | 1 | 1 | 0 | 1 |
| 10 | 1 | 1 | 0 | 0 |

$F_2 = A_0B_0' + A_0A_1B_1' + A_1B_0'B_1'$

A = B

| $A_0A_1 \setminus B_0B_1$ | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 1 | 0 | 0 | 0 |
| 01 | 0 | 1 | 0 | 0 |
| 11 | 0 | 0 | 1 | 0 |
| 10 | 0 | 0 | 0 | 1 |

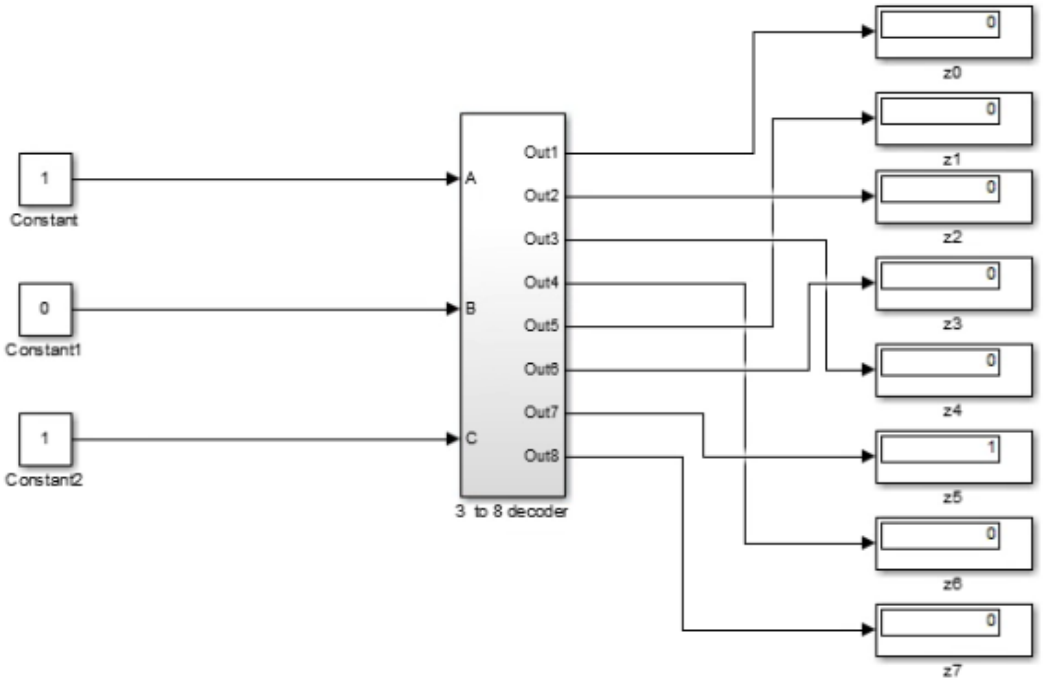
$F_3 = A_0'A_1'B_0'B_1' + A_0'A_1B_0'B_1 + A_0A_1B_0B_1 + A_0A_1'B_0B_1'$




Question 5.slx is fully tested and attached.

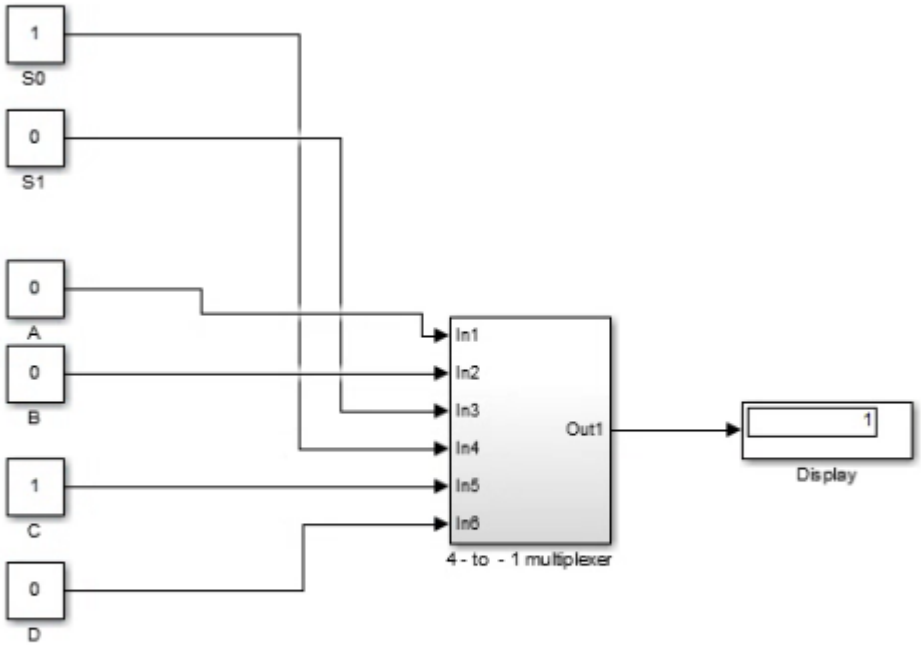
6.

a)




Question_6_a.slx is fully tested and attached.

b)




Question_6_b.slx is fully tested and attached.