Digital logic Design | Quiz #1

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DS-M

Q1 (a) $V = \left(A + (B+C)\right)(B\bar{C}) \cdot \left(\bar{A}\overline{(B+C)}(\bar{B}C)\right)$

$= \left[A + (B+C)(\bar{B}+\bar{C})\right] \cdot \left[\bar{A} + \overline{(B+C)} + \bar{B}\cdot C\right]$

$= \left[A + B\cdot\bar{B} + B\bar{C} + \bar{B}C + C\bar{C}\right]\left[\bar{A} + \bar{B}\cdot\bar{C} + BC\right]$

$= \left[A + B\bar{C} + \bar{B}C\right] \cdot \left[\bar{A} + \bar{B}\cdot\bar{C} + BC\right]$

$\Rightarrow A\cdot\bar{A} + A\bar{B}\bar{C} + ABC + \bar{A}\bar{B}\bar{C} + B\bar{C}\cdot\bar{B}C + BC\bar{C} + \bar{A}B\bar{C}$
$+ \bar{B}C\cdot\bar{B}C + \bar{B}C\cdot BC$

$= 0 + A\bar{B}\bar{C} + ABC + \bar{A}B\bar{C} + 0 + 0 + A\bar{B}C + 0 + 0$

$Y = A\bar{B}\bar{C} + ABC + \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C$

sum of products form

(a m term of y will be)

100	111	010	001
4	7	2	1

$y = \sum m(1, 2, 4, 7)$

	00	01	11	10
0		1		1
1	1		1	

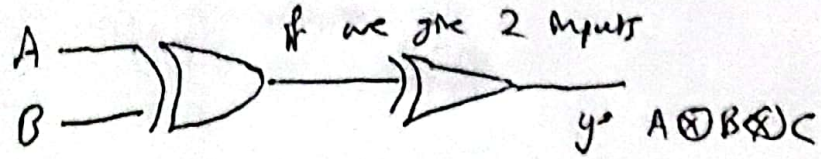
$Y = \bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}C + ABC$

$= \bar{A}(B\bar{C} + \bar{B}C) + A(\bar{B}\bar{C} + AC)$ $\Rightarrow$ $A(B \otimes C) + A(B \odot C)$

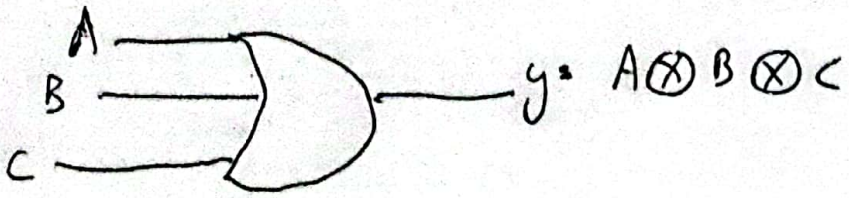
$= \bar{A}(B \otimes C) + A(B \otimes C)$

$Y = A \otimes B \otimes C$

$Y = A \otimes B \otimes C$



If we have 3



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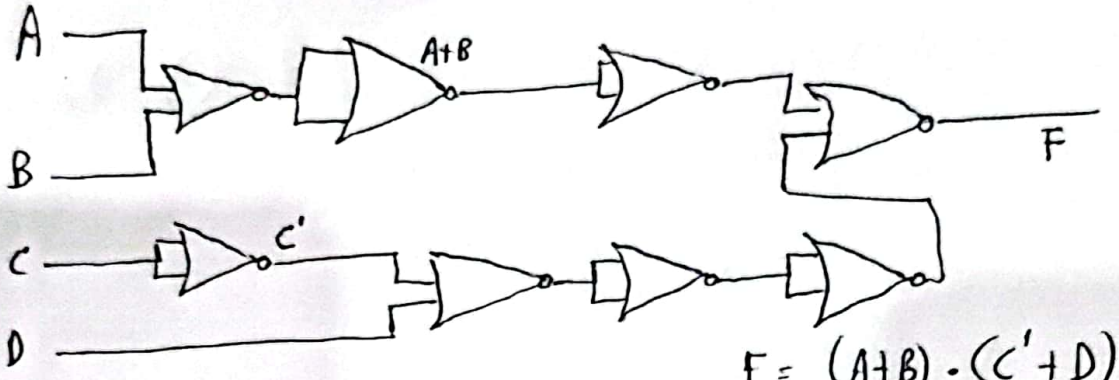
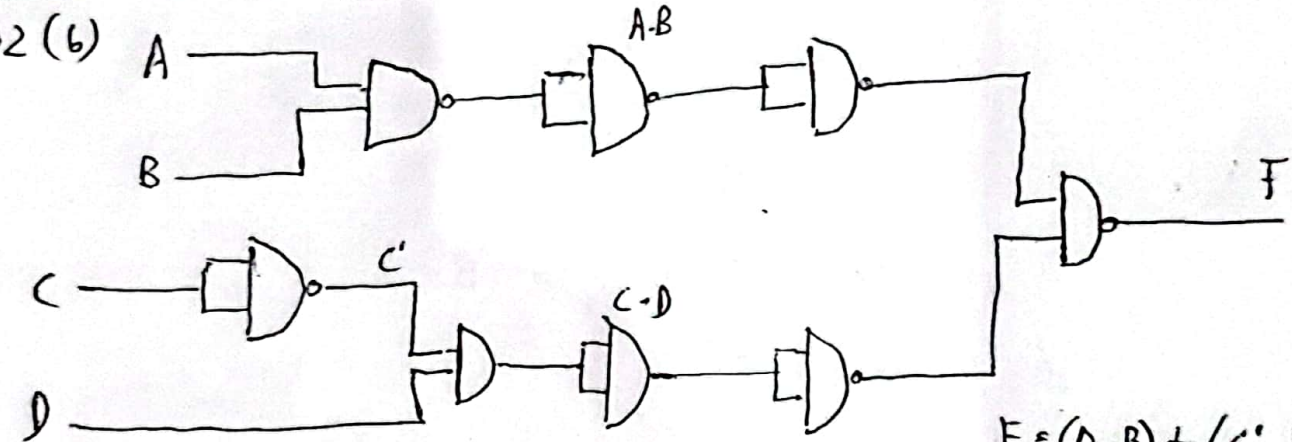
Q2 (a)



$F = (A+B) \cdot (C' + D)$

Q2 (b)



$F = (A \cdot B) + (C' \cdot D)$

Q3 1. (a) $A + A \cdot B + A \cdot C \cdot D + A \cdot B \cdot C \cdot D = A$

$\Rightarrow A + A \cdot B + ACD + ABCD$

$A + ACD + ABCD$

$= A + ABCD$

$\Rightarrow A$

Q3 1.(b) $(X+Y)\cdot(X+\bar{Y})$

$(X\cdot X)+(X\cdot\bar{Y})+(X\cdot Y)+(Y\cdot\bar{Y})$

$X + X\cdot\bar{Y} + XY + 0$

$X + X\bar{Y} + XY$

$X + X(\bar{Y} + Y)$

$X + X \Longrightarrow \boxed{X}$

Q3 1.(c) $(A+B)\cdot(A+C)$

$(A\cdot A)+(A\cdot C)+(B\cdot A)+(B\cdot C)$

$A + AC + AB + BC$

$\Longrightarrow A + AB + BC \longrightarrow A + B\cdot C$

(d) $1 + A+B + A\cdot C + A\cdot G$

Anything OR-ed with 1 will always result in 1 so we dont need to apply any laws.

Q3 ii

wx \ yz	00	01	11	10
00	0			0
01	0	0	0	
11			0	
10				0

$(w+\bar{x}+\bar{y}+\bar{z})+(\bar{w}+\bar{x}+\bar{y}+\bar{z})$

$\therefore (\bar{x}+\bar{y}+\bar{z})$

$(W+X+\bar{Y}+Z)+(\bar{W}+X+\bar{Y}+Z)$

$\therefore (X+\bar{Y}+Z)$

A B C D

$(W+X+X+Z)\cdot(W+X+\bar{Y}+Z)$

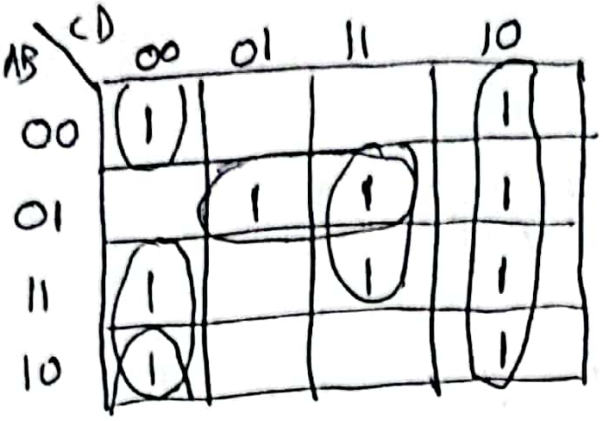
$\therefore (W+X+Z)$

$(W+\bar{X}+Y+Z)\cdot(W+\bar{X}+Y+\bar{Z})$

$\therefore W+\bar{X}+Y$

$\hookrightarrow (W+X+Z)\cdot(W+\bar{X}+Y)\cdot(\bar{x}+\bar{y}+\bar{z})+(x+\bar{Y}+Z)$

Q3 (ii) (b)



(1) $\bar{A}\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} = \bar{B}\bar{C}\bar{D}$

(2) $AB\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} = A\bar{C}\bar{D}$

(3) $\bar{A}B\bar{C}\bar{D} + \bar{A}BCD = \bar{A}BD$

(4) $\bar{A}BCD + ABCD = BCD$

(5) $\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}BC\bar{D} + ABC\bar{D} + A\bar{B}C\bar{D} = C\bar{D}$

Ans → $\bar{B}\bar{C}\bar{D} + A\bar{C}\bar{D} + \bar{A}BD + BCD + C\bar{D}$

Q3 (iii) (a) $F = AB' + CD'$

$(AB')' \cdot (CD')'$

$(\bar{A} + B) \cdot (\bar{C} + D)$

(iii) (b) $F = (A + C) \cdot (A' + B')$

$(A + C)' + (A' + B')$

$\bar{A} \cdot \bar{C} + AB$