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- 8. (a) 2 ⇒ $\bar{A} = A$
- (b) 3 ⇒ $A \cdot \bar{A} = 0$
- (c) 5 ⇒ $A + A = A$
- (d) 6 ⇒ $A + \bar{A} = 1$
- (e) 2 ⇒ $A + 1 = 1$
- (f) 9 ⇒ $\bar{\bar{A}} = A$

9. (b) $\overline{(A+B)(C+D)}$
 $= \overline{A+B} + \overline{C+D}$
 $= \bar{A}\bar{B} + \bar{C}\bar{D}$

10. (a) $\overline{A\bar{B}(C+D)}$
 $= \overline{A\bar{B}} + \overline{(C+D)}$
 $= \bar{A} + B + \bar{C}\bar{D}$

(b) $\overline{ABC(D+EF)}$
 $= \bar{A}\bar{B}\bar{C} + \overline{(D+EF)}$
 $= \bar{A}\bar{B}\bar{C} + \bar{D}\bar{E}\bar{F}$
 $= \bar{A}\bar{B}\bar{C} + \bar{D}\bar{E}\bar{F}$
 $= \bar{A}\bar{B}\bar{C} + \bar{D}\bar{E}\bar{F}$

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

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38. (a) $\overline{A\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}C}$

A	B	C	
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

 $\Rightarrow \bar{A}\bar{B} + \bar{B}\bar{C}$

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

A	B	C	
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

 $\Rightarrow AC$

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

A	B	C	
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

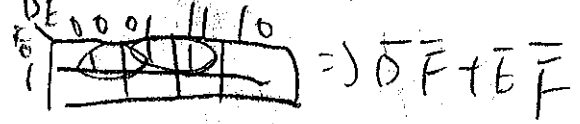
 $\Rightarrow B$

(d) $\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C}$

A	B	C	
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

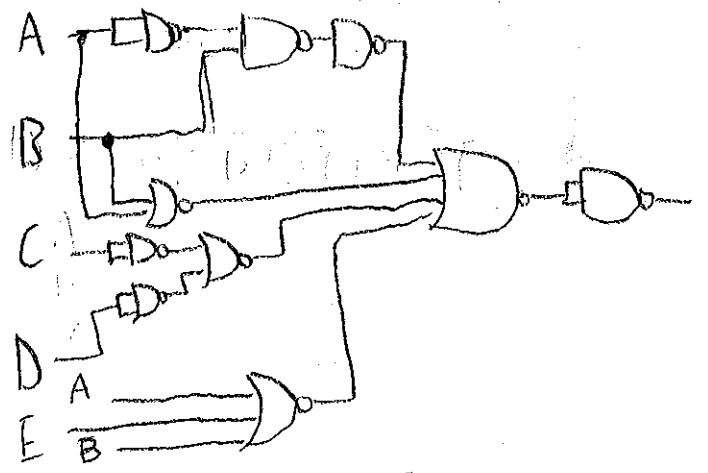
 $\Rightarrow \bar{C}$

39. (c) $\overline{DEF + DE\bar{F} + D\bar{E}F}$

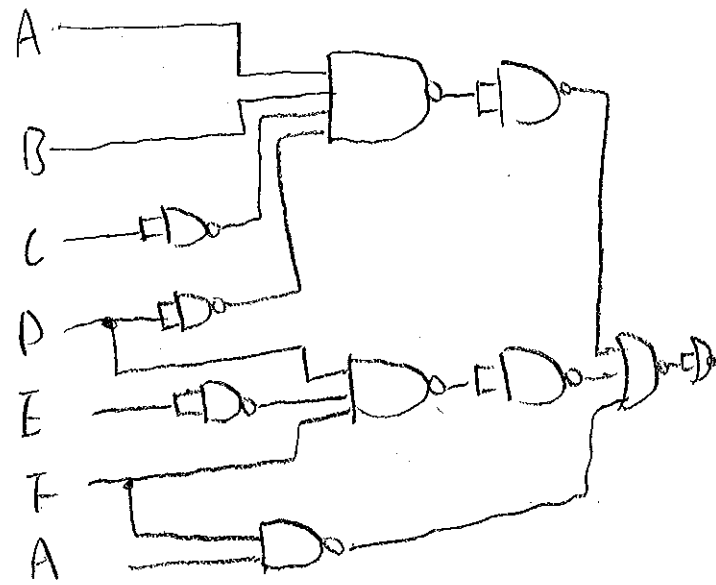


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10. (a) $X = \bar{A}B + CD + (A + \bar{B})(C + D + \bar{E})$
 $\Rightarrow X = \bar{A}B + CD + (\bar{A}\bar{B})(C + D + \bar{E})$
 $\Rightarrow X = \bar{A}B + CD + \bar{A}\bar{B}C + \bar{A}\bar{B}D + \bar{A}\bar{B}\bar{E}$
 $\Rightarrow X = \bar{A}B + CD + \bar{A}\bar{B}C + \bar{A}\bar{B}D + \bar{A}\bar{B}\bar{E}$

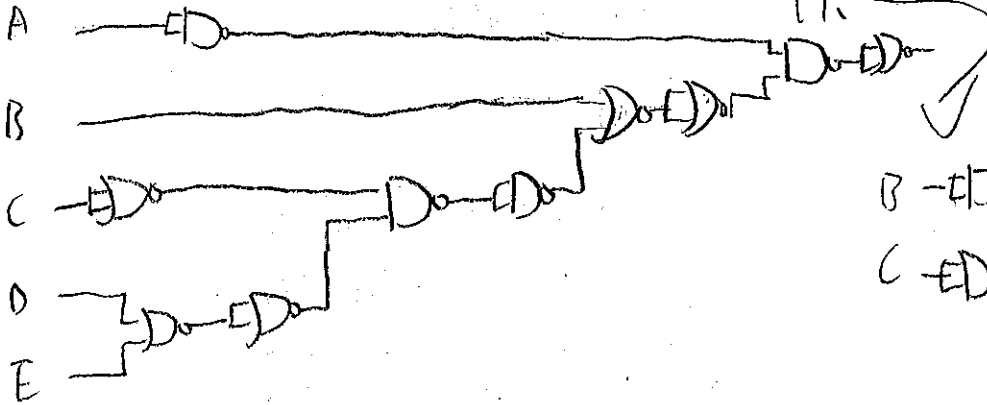


(b) $X = AB\bar{C}\bar{D} + D\bar{E}F + A\bar{B}\bar{C}$

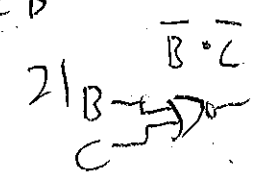
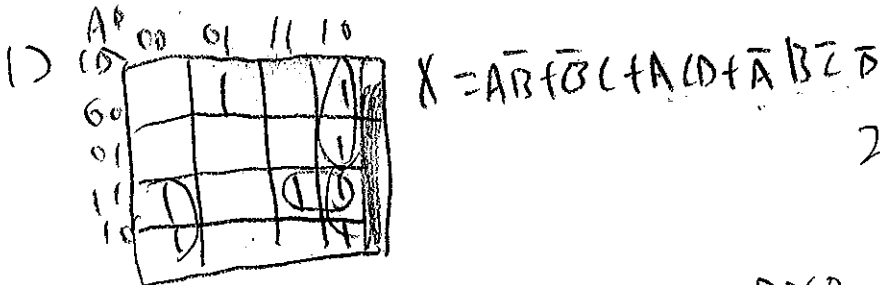
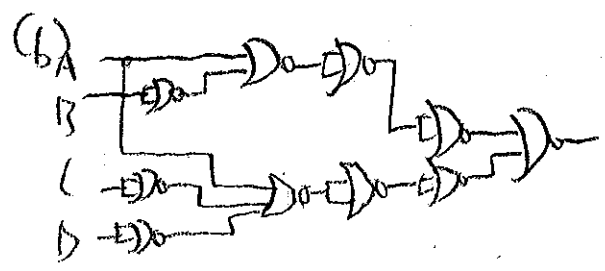
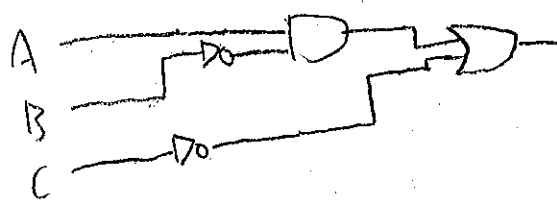
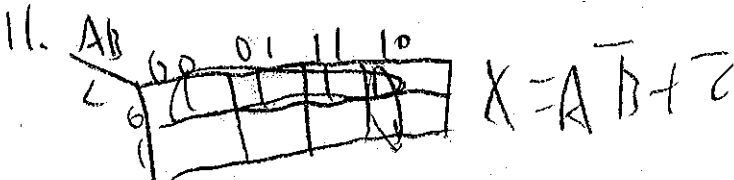
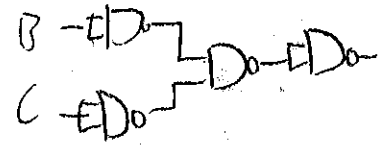


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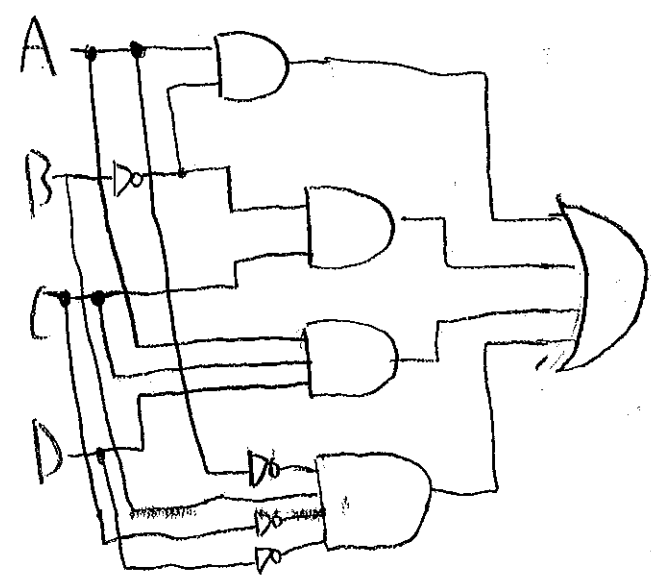
10 (c) $X = \bar{A} [B + Z (D \bar{E})]$



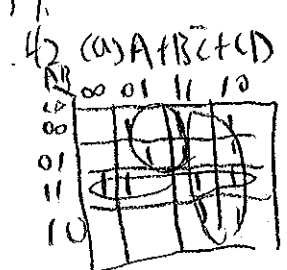
19.



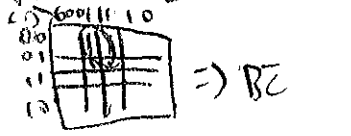
(c) $\bar{A} \bar{B} \bar{C} \bar{D} + \bar{A} B \bar{C} \bar{D} + \bar{A} B \bar{C} D + A \bar{B} \bar{C} \bar{D} + A \bar{B} C \bar{D} + A \bar{B} C D + A B \bar{C} \bar{D} + A B \bar{C} D + A B C \bar{D} + A B C D$



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$\bar{A} \bar{B} \bar{C} \bar{D} + \bar{A} \bar{B} \bar{C} D + \bar{A} \bar{B} C \bar{D} + \bar{A} \bar{B} C D + \bar{A} B \bar{C} \bar{D} + \bar{A} B \bar{C} D + \bar{A} B C \bar{D} + \bar{A} B C D + A \bar{B} \bar{C} \bar{D} + A \bar{B} \bar{C} D + A \bar{B} C \bar{D} + A \bar{B} C D + A B \bar{C} \bar{D} + A B \bar{C} D + A B C \bar{D} + A B C D$



$\Rightarrow A + \bar{B} \bar{C} + \bar{C} D$

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



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

$= \bar{A} \bar{B} C \bar{D} + \bar{A} \bar{B} C D + \bar{A} \bar{B} C \bar{D} + \bar{A} \bar{B} C D + \bar{A} \bar{B} C \bar{D} + \bar{A} \bar{B} C D + \bar{A} \bar{B} C \bar{D} + \bar{A} \bar{B} C D$



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



$\Rightarrow \bar{B} + \bar{B}$