Lösningsförslag till tentamen ETE235 Digitalteknik 2012-08-21

1a)

$249/2 = 124 + 1$ LSB

$124/2 = 62 + 0$

$62/2 = 31 + 0$

$31/2 = 15 + 1$

$15/2 = 7 + 1$

$7/2 = 3 + 1$

$3/2 = 1 + 1$

$1/2 = 0 + 1$ MSB

ALLTSÅ $249_{10} = 11111001_2$

1b)

$\overbrace{1000}^{8}\overbrace{1111}^{F}{}_2 = 8F_{16}$

1c)

$\overbrace{100}^{4}\overbrace{011}^{3}\overbrace{111}^{7}{}_2 = 217_8$

1d)

$10001111_2 =$

$= 1\cdot 2^7 + 0\cdot 2^6 + 0\cdot 2^5 + 0\cdot 2^4 + 1\cdot 2^3 + 1\cdot 2^2 + 1\cdot 2^1 + 1\cdot 2^0 =$

$= 128 + 0 + 0 + 0 + 8 + 4 + 2 + 1 = 143_{10}$

1e)

$10001111_2 = \overbrace{0001}^{1}\overbrace{0100}^{4}\overbrace{0011}^{3}$ BCD

1f)

$0,40625 \cdot 2 = 0,8125 + 0$ MSB

$0,8125 \cdot 2 = 0,625 + 1$ ↓

$0,625 \cdot 2 = 0,25 + 1$

$0,25 \cdot 2 = 0,5 + 0$

$0,5 \cdot 2 = 0 + 1$ LSB

ALLTSÅ $0,40625_{10} = 0,01101_{2}$

1g)

$$\begin{array}{r} 11101001 \\ - \quad\quad\quad 1 \\ \hline 11101000 \end{array}$$

$00010111 = +23$

ALLTSÅ $11101001 = -23$

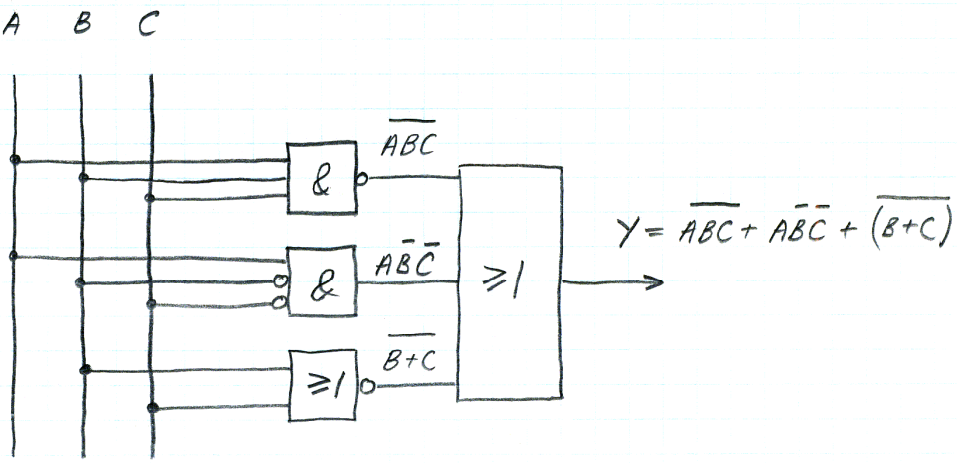
ENLIGT TVÅKOMPLEMENTMETODEN

VÄNSTRA BITEN ÄR TECKENBIT:

0 → POSITIVT TAL

1 → NEGATIVT TAL

2a)



2b)

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

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

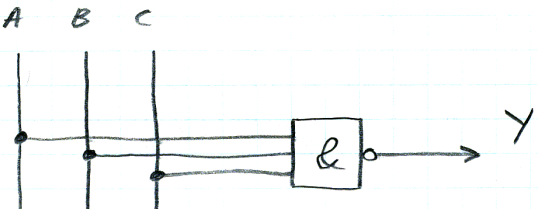
$$= \overline{ABC} + \bar{B}\bar{C}(A+1) =$$

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

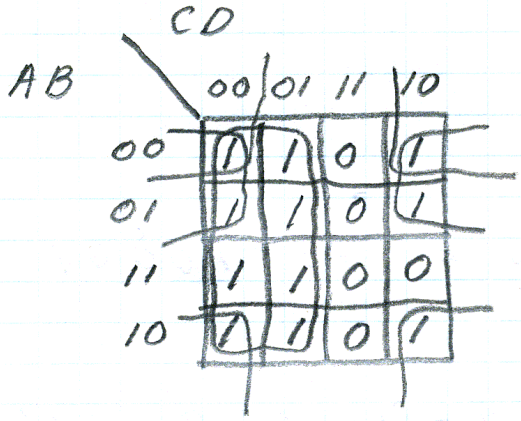
$$= \bar{A} + \bar{B} + \bar{C} + \bar{B}\bar{C} + \bar{B}\bar{C} =$$

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

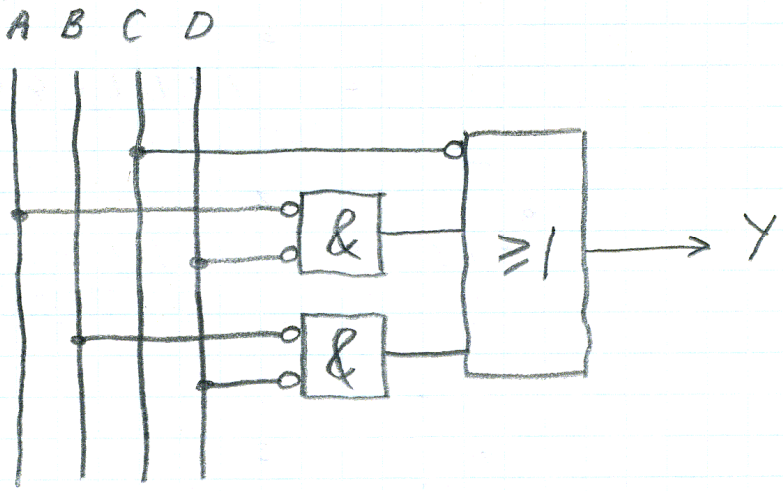
$$= \bar{A} + \bar{B} + \bar{C} = \overline{ABC}$$



3a)

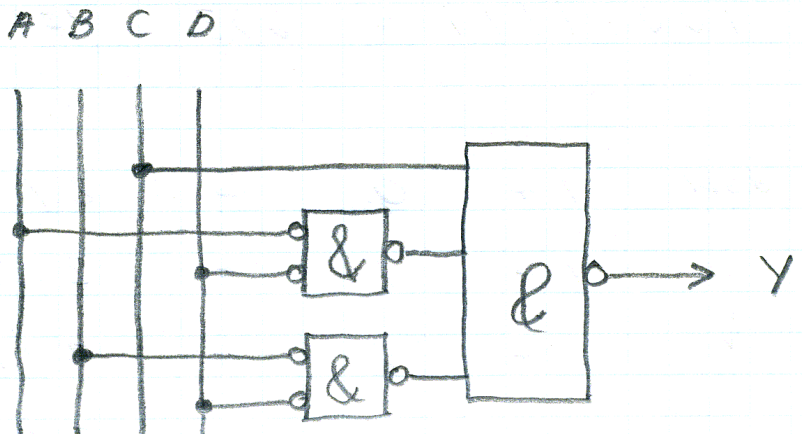


$$Y = \bar{C} + \bar{A}\bar{D} + \bar{B}\bar{D}$$



3b)

$$Y = \overline{\bar{C} + \bar{A}\bar{D} + \bar{B}\bar{D}} = \overline{C \cdot \overline{\bar{A}\bar{D}} \cdot \overline{\bar{B}\bar{D}}}$$



3c)

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

$$\overline{Y} = CD + ABC$$

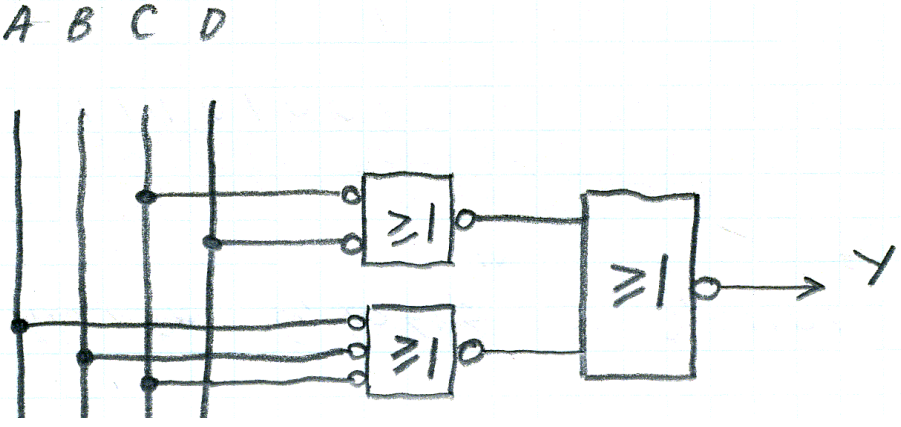
$$Y = \overline{CD + ABC} =$$

$$= \overline{\overline{CD + ABC}} =$$

$$= \overline{\overline{CD} \cdot \overline{ABC}} =$$

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

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



4.

$D = Q_C + \bar{Q}_A \bar{Q}_B$

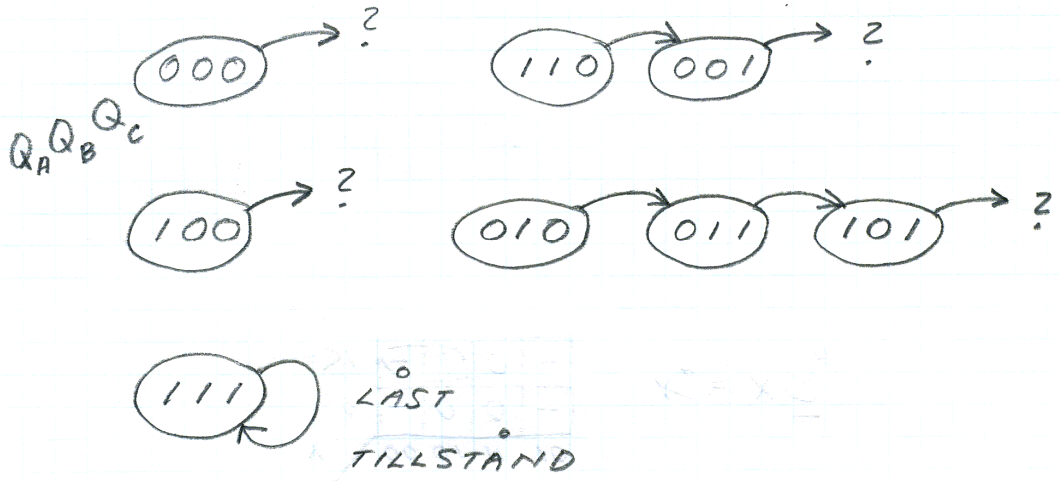
$S = \bar{Q}_B$

$R = (Q_A \oplus Q_C) + \bar{Q}_B$

$T = Q_C \oplus Q_B$

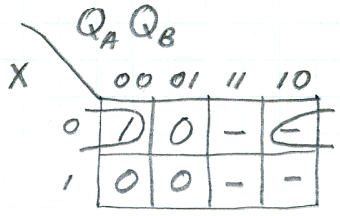
FÖRE CP						EFTER CP		
Q_A	Q_B	Q_C	D	S	R	T	Q_A^+	Q_B^+	Q_C^+
0	0	0	1	1	1 ← *)	0	1	?	0
0	0	1	1	1	1 ← *)	1	1	?	0
0	1	0	0	0	0	1	0	1	1
0	1	1	1	0	1	0	1	0	1
1	0	0	0	1	1 ← *)	0	0	?	1
1	0	1	1	1	1 ← *)	1	1	?	0
1	1	0	0	0	1	1	0	0	1
1	1	1	1	0	0	0	1	1	1

*) SR-VIPPAN ÄR FELAKTIGT ANVÄND. S OCH R FÅR ALDRIG VARA 1 SAMTIDIGT.

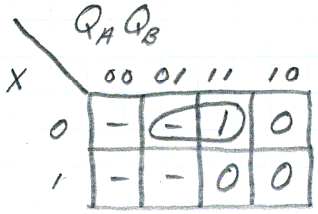


5. FÖRE CP EFTER CP

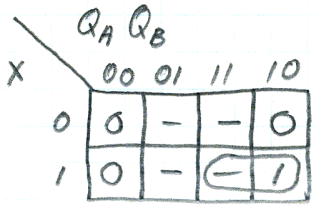
X	Q_A	Q_B	J_A	K_A	J_B	K_B	Q_A^+	Q_B^+
0	0	0	1	-	0	-	1	0
0	0	1	0	-	-	0	0	1
0	1	0	-	0	0	-	1	0
0	1	1	-	1	-	0	0	1
1	0	0	0	-	0	-	0	0
1	0	1	0	-	-	1	0	0
1	1	0	-	0	1	-	1	1
1	1	1	-	0	-	0	1	1



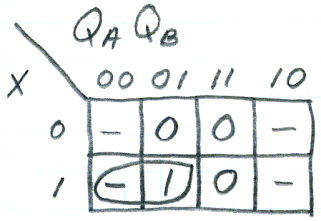
$J_A = \bar{X}\,\bar{Q}_B$



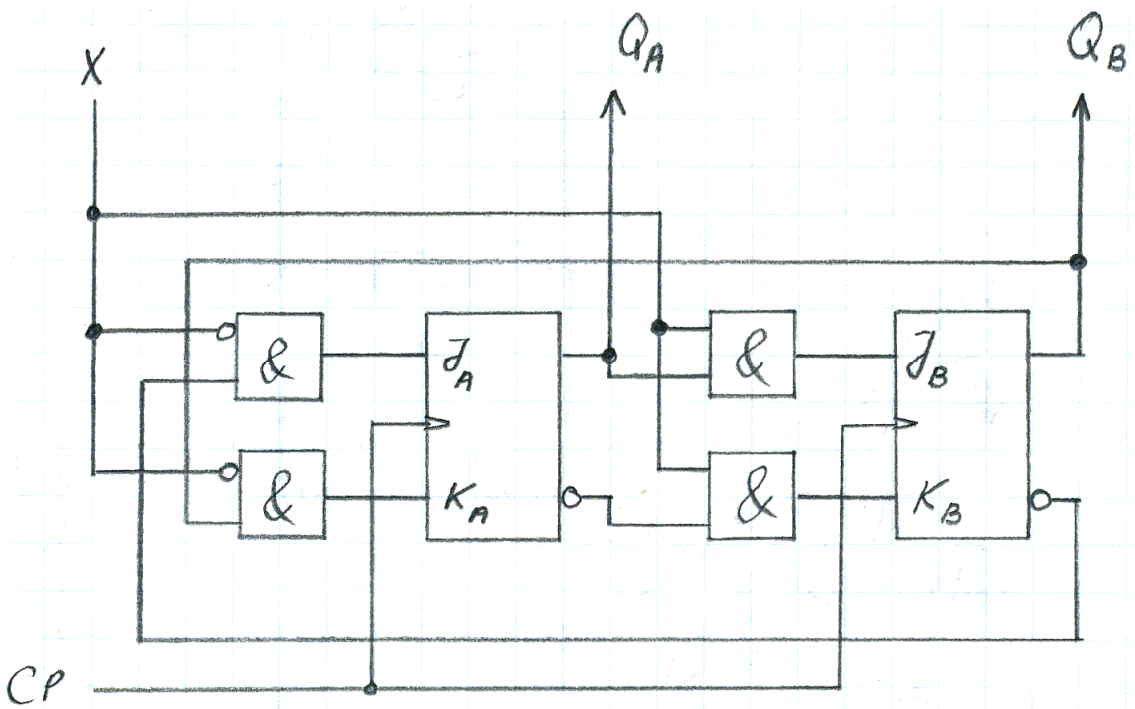
$K_A = \bar{X}\,Q_B$



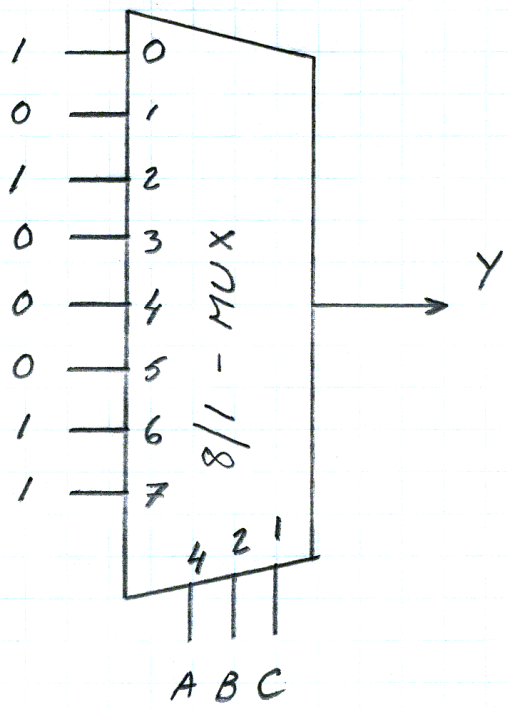
$J_B = X\,Q_A$



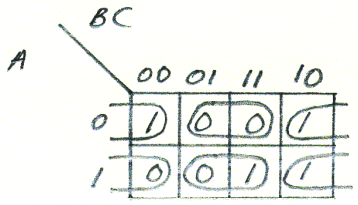
$K_B = X\,\bar{Q}_A$



6a)



6b)

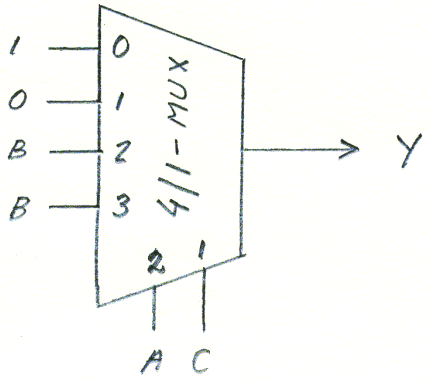


$AC = 00 \rightarrow Y = 1$

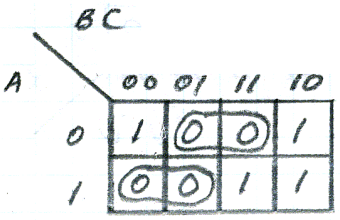
$AC = 01 \rightarrow Y = 0$

$AC = 10 \rightarrow Y = B$

$AC = 11 \rightarrow Y = B$



6c)



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

$$Y = \overline{\bar{A}C + A\bar{B}} = \overline{\bar{A}C} \cdot \overline{A\bar{B}}$$