Lösningsförslag till tentamen ETE235 Digitalteknik 2013-06-18

1a) 2013/2 = 1006 REST 1 LSB

1006/2 = 503 REST 0

503/2 = 251 REST 1

251/2 = 125 REST 1

125/2 = 62 REST 1

62/2 = 31 REST 0

31/2 = 15 REST 1

15/2 = 7 REST 1

7/2 = 3 REST 1

3/2 = 1 REST 1 ↑

1/2 = 0 REST 1 MSB

$2013_{10} = 11111011101_2$

1b) $\overbrace{0110}^{6}\overbrace{1010}^{A}_2 = 6A_{16}$

1c) $\overbrace{011}^{3}\overbrace{010}^{2}\overbrace{10}^{2}_2 = 152_8$

1d) $01101010_2 = 0\cdot2^7+1\cdot2^6+1\cdot2^5+0\cdot2^4+1\cdot2^3+0\cdot2^2+1\cdot2^1+0\cdot2^0 =$

$= 0+64+32+0+8+0+2+0 = 106_{10}$

1e) $106_{10} = 0001\ 0000\ 0110_{NBCD}$

1f)

$0,71875 \cdot 2 = 0,4375 + 1$ MSB

$0,4375 \cdot 2 = 0,875 + 0$ ↓

$0,875 \cdot 2 = 0,75 + 1$

$0,75 \cdot 2 = 0,5 + 1$

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

$0,71875_{10} = 0.10111_{2}$

1g)

10101011 ← NEGATIVT TAL ENLIGT TVÅKOMPLEMENT METODEN

$-\quad 1$ ← SUBTRAHERA ETT

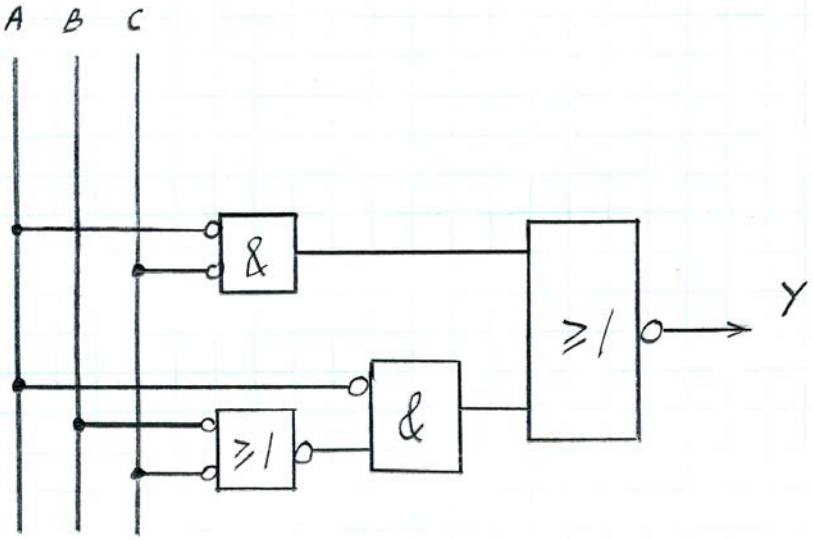
10101010

01010101 ← INVERTERA

$01010101_{2} = +85$

ALLTSÅ $10101011_{2} = -85$ ENLIGT TVÅKOMPLEMENTMETODEN

2a/ $Y = \overline{\bar{A}\bar{C} + \bar{A}(\bar{B}+\bar{C})}$

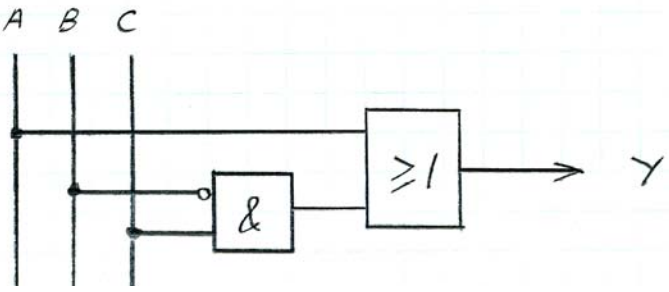


2b/ $Y = \overline{\bar{A}\bar{C} + \bar{A}(\bar{B}+\bar{C})} = \overline{\bar{A}\bar{C} + \bar{A}BC} =$

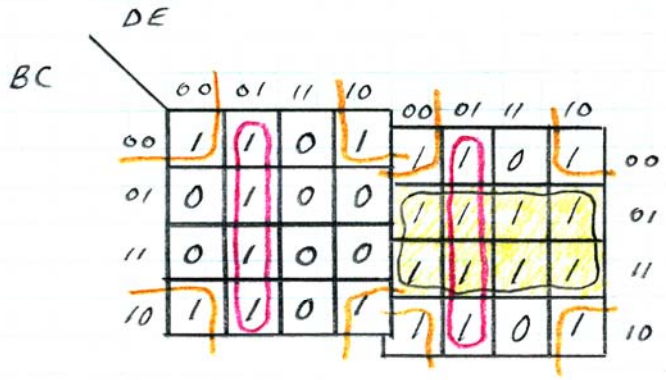
$= \overline{\bar{A}\bar{C}} \cdot \overline{\bar{A}BC} = (A+C)\cdot(A+\bar{B}+\bar{C}) =$

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

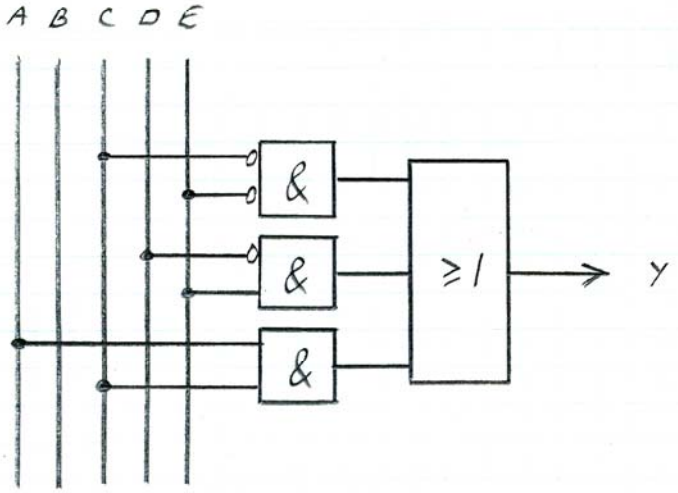
$= A(1+\bar{B}+\bar{C}+C) + \bar{B}C = A + \bar{B}C$



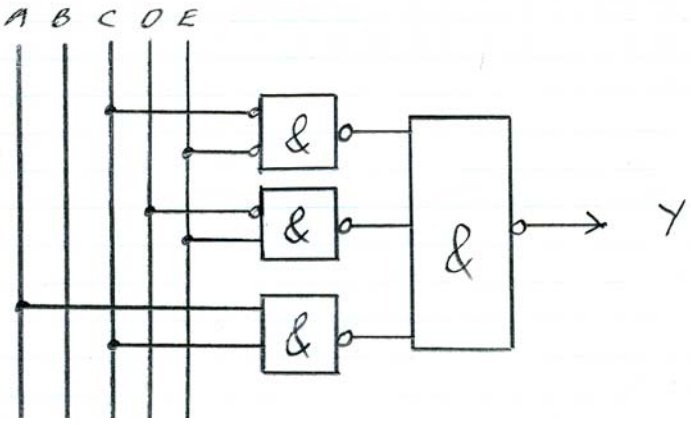
3a)



$$Y = \bar{C}\bar{E} + \bar{D}E + AC$$



3b) $$Y = \overline{\bar{C}\bar{E} + \bar{D}E + AC} = \overline{\bar{C}\bar{E}} \cdot \overline{\bar{D}E} \cdot \overline{AC}$$



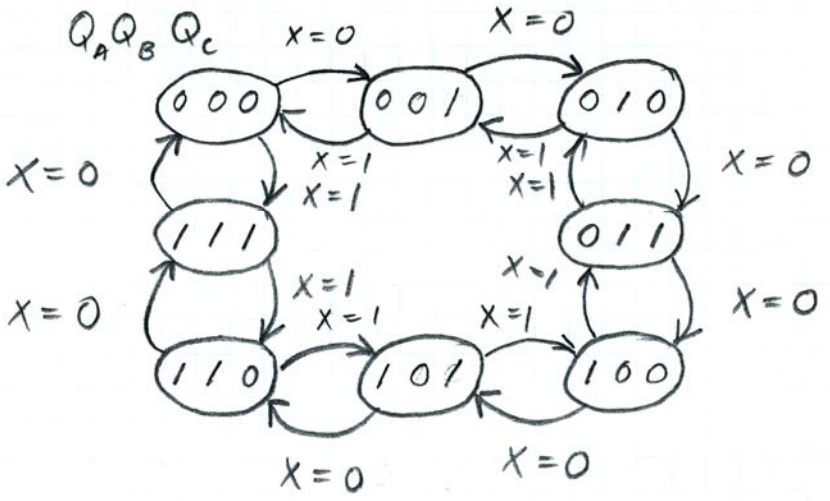
4. $T = Q_C Q_B \bar{X} + X \bar{Q}_C \bar{Q}_B$

$S = Q_C \bar{X} \bar{Q}_B + X \bar{Q}_C \bar{Q}_B$

$R = Q_C Q_B \bar{X} + Q_B X \bar{Q}_C$

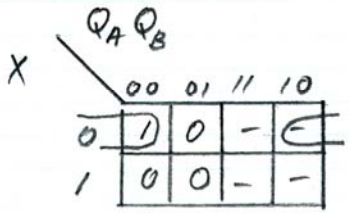
$D = \bar{Q}_C$

X	Q_A	Q_B	Q_C	T	S	R	D	Q_A^+	Q_B^+	Q_C^+
0	0	0	0	0	0	0	1	0	0	1
0	0	0	1	0	1	0	0	0	1	0
0	0	1	0	0	0	0	1	0	1	1
0	0	1	1	1	0	1	0	1	0	0
0	1	0	0	0	0	0	1	1	0	1
0	1	0	1	0	1	0	0	1	1	0
0	1	1	0	0	0	0	1	1	1	1
0	1	1	1	1	0	1	0	0	0	0
1	0	0	0	1	1	0	1	1	1	1
1	0	0	1	0	0	0	0	0	0	0
1	0	1	0	0	0	1	1	0	0	1
1	0	1	1	0	0	0	0	0	1	0
1	1	0	0	1	1	0	1	0	1	1
1	1	0	1	0	0	0	0	1	0	0
1	1	1	0	0	0	1	1	1	0	1
1	1	1	1	0	0	0	0	1	1	0

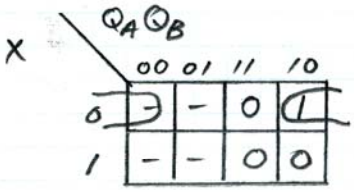


5.

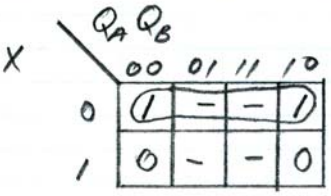
X	Q_A	Q_B	J_A	K_A	J_B	K_B	Q_A^+	Q_B^+
0	0	0	1	-	1	-	1	1
0	0	1	0	-	-	1	0	0
0	1	0	-	1	1	-	0	1
0	1	1	-	0	-	1	1	0
1	0	0	0	-	0	-	0	0
1	0	1	0	-	-	0	0	1
1	1	0	-	0	0	-	1	0
1	1	1	-	0	-	0	1	1



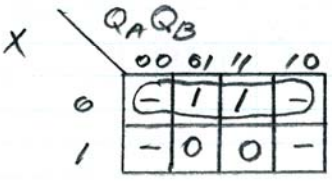
$$J_A = \bar{X}\,\bar{Q}_B = \overline{X + Q_B}$$



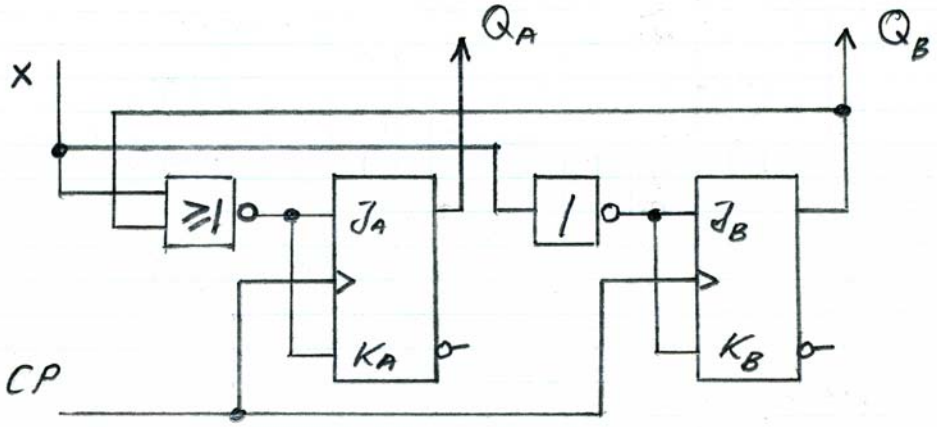
$$K_A = \bar{X}\,\bar{Q}_B = \overline{X + Q_B}$$



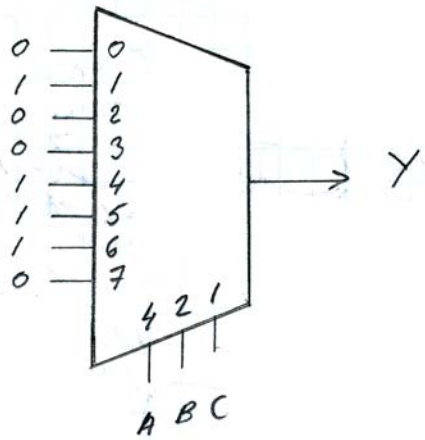
$$J_B = \bar{X}$$



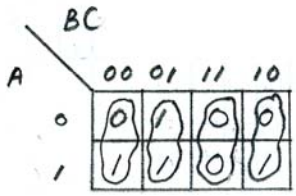
$$K_B = \bar{X}$$



6a)



6b)

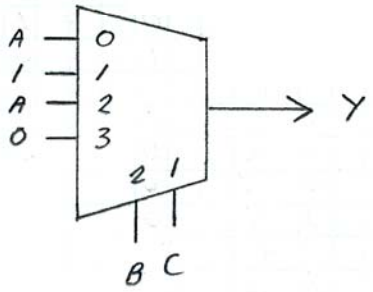


$BC = 00 \Rightarrow Y = A$

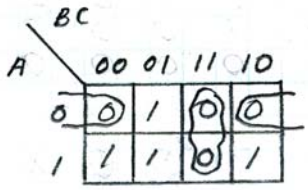
$BC = 01 \Rightarrow Y = 1$

$BC = 10 \Rightarrow Y = A$

$BC = 11 \Rightarrow Y = 0$



6c)



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

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