Preklopna vezja

Pisni izpit, 10. 09. 2008

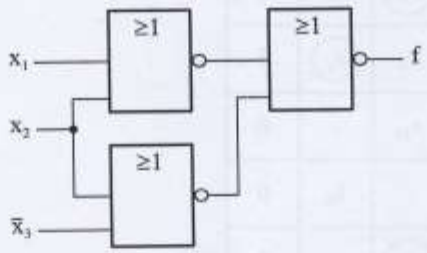
1. Preverite ali velja enakost:

   a. $(x_2 \rightarrow \overline{x}_1) \oplus \overline{x}_3 = (x_1 \mid x_2) \equiv x_3$

   b. $S_{0,1,3}(\overline{x}_1, x_2, \overline{x}_3) = S_{0,2,3}(x_1, \overline{x}_2, x_3)$

   (15%)

2. Ugotovite ali se vezje na sliki obnaša kot pragovni element. V primeru da se, mu določite uteži in prag.



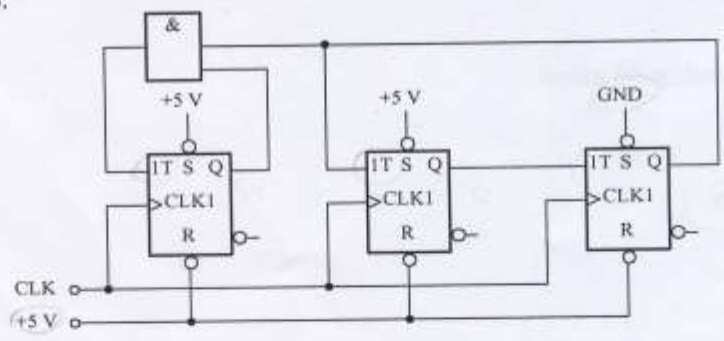
   (15%)

3. Podano funkcijo realizirajte z enim multipleksorjem in enim demultipleksorjem (oba s po dvema izbirnima vhodoma). Na voljo imate še negator.

$$f(x_1,\ldots,x_5) = x_1x_2\overline{x}_3\overline{x}_4\overline{x}_5 + \overline{x}_1x_2x_4x_5 + \overline{x}_1x_3\overline{x}_4 + x_1x_2x_3x_4\overline{x}_5 + \overline{x}_1\overline{x}_3\overline{x}_4 + \overline{x}_1\overline{x}_2x_4 + \overline{x}_1\overline{x}_2x_4x_5 + \overline{x}_1x_3x_4$$

   (15%)

4. Študent je dobil nalogo, da izdela sinhronski števec, ki šteje po modulu 8. Zgradil je vezje, ki je podano na sliki, in ugotovil, da ne deluje pravilno. S pomočjo vzbujalne tabele in diagrama prehajanja stanj poskušajte za prikazano vezje odkriti in odpraviti napake, tako da bo vezje pravilno delovalo.



   (25%)

OBRNITE LIST

5. Določite minimalno spojeno tabelo prehajanja stanj asinhronskega tipa, če je podana naslednja primitivna tabela:

Sed. stanje	Naslednje stanje				Izhod
	00	01	11	10	z
s_1	(s_1)	s_6	-	s_3	0
s_2	s_1	(s_2)	s_8	-	1
s_3	s_7	-	s_4	(s_3)	0
s_4	-	s_6	(s_4)	-	1
s_5	s_7	-	s_4	(s_5)	1
s_6	-	(s_6)	s_{10}	-	0
s_7	(s_7)	s_2	-	s_9	0
s_8	-	s_{11}	(s_8)	s_5	1
s_9	s_7	-	-	(s_9)	0
s_{10}	-	s_2	(s_{10})	s_5	1
s_{11}	s_1	(s_{11})	s_{10}	-	1

(30%)

Čas reševanja nalog: 90 minut

By BoB

① a) $(x_2 \to \overline{x}_1) \oplus \overline{x}_3 = (x_1 | x_2) \equiv x_3 \Rightarrow (x_2 \to \overline{x}_1) \oplus \overline{x}_3 = f_1$

$(x_1 | x_2) \equiv x_3 = f_2$

$x_2 \to x_1 = x_1 + \overline{x}_2$

$x_2 \to \overline{x}_1 = \overline{x}_1 + \overline{x}_2$

x_1	x_3	$\oplus$
0	0	0
0	1	1
1	0	1
1	1	0

x_1	x_2	x_3	$x_2 \to \overline{x}_1$	$(x_2 \to \overline{x}_1) \oplus \overline{x}_3$	$(x_1 \| x_2)$	$(x_1 \| x_2) \equiv x_3$
0	0	0	1	0	1	0
0	0	1	1	1	1	1
0	1	0	1	0	1	0
0	1	1	1	1	1	1
1	0	0	1	0	1	0
1	0	1	1	1	1	1
1	1	0	0	1	0	1
1	1	1	0	0	0	0

(f_1, f_2)

$\boxed{f_1 = f_2}$

$x_1 | x_2 = \overline{x}_1 + \overline{x}_2$

b) $S_{0,1,3}(\overline{x}_1, x_2, \overline{x}_3) = S_{0,2,3}(x_1, \overline{x}_2, x_3)$

$\quad\; \| \qquad\qquad\qquad \|$

$\quad f_1 \qquad\qquad\qquad f_2$

$f_1 = \overline{A}\overline{B}\overline{C} + A\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}\overline{B}C + ABC = x_1\overline{x}_2x_3 + \overline{x}_1\overline{x}_2x_3 + x_1x_2x_3 + x_1\overline{x}_2\overline{x}_3 + \overline{x}_1x_2\overline{x}_3$

$A = \overline{x}_1 \quad B = x_2 \quad C = \overline{x}_3$

$f_1 = m_1 + m_2 + m_4 + m_5 + m_7$

$f_2 = \overline{A}\overline{B}\overline{C} + \overline{A}BC + A\overline{B}C + AB\overline{C} + ABC = \overline{x}_1x_2\overline{x}_3 + \overline{x}_1\overline{x}_2x_3 + x_1x_2x_3 + x_1\overline{x}_2\overline{x}_3 + x_1\overline{x}_2x_3$

$A = x_1 \quad B = \overline{x}_2 \quad C = x_3 \qquad f_2 = m_1 + m_2 + m_4 + m_5 + m_7$

$\boxed{f_1 = f_2}$

By BOB

② Ali je dvoja bit pragovni element?

$$f = \overline{(\overline{x_1 + x_2}) + (\overline{x_1 + x_3})} = \overline{(\bar{x}_1 \bar{x}_2) + (\bar{x}_1 x_3)} = (\overline{\bar{x}_1 \bar{x}_2})(\overline{\bar{x}_1 x_3})$$

$$= (x_1 + x_2) \cdot (x_1 + \bar{x}_3) = x_1 + x_1 x_2 + x_1 \bar{x}_3 + x_2 \bar{x}_3$$

x_1	x_2	x_3	f			P
0	0	0	0			0
0	0	1	0	3		-1
0	1	0	1			1
0	1	1	0		4	0
1	0	0	1			2
1	0	1	1	1		1
1	1	0	1			3
1	1	1	1			2

2

$\boxed{P = 1}$

1) $w_1 > 0 \quad (0 \cdot w_1 + 1 \cdot w_2 + 1 \cdot w_3 < 1 \cdot w_1 + 1 \cdot w_2 + 1 \cdot w_3)$

$0 < w_1$

2) $w_3 < 0$

3) $w_2 > 0$

4) $0 \cdot w_1 + 1 \cdot w_2 + 1 \cdot w_3 < 1 \cdot w_1 + 0 \cdot w_2 + 1 \cdot w_3$

$w_2 < w_1$

$\boxed{\begin{aligned} w_1 &= 2 \\ w_2 &= 1 \\ w_3 &= -1 \end{aligned}}$

③ $f(x_1 \ldots x_5) = x_1 x_2 \bar{x}_3 \bar{x}_4 \bar{x}_5 + \bar{x}_1 x_2 x_4 x_5 + \bar{x}_1 x_3 \bar{x}_4 + x_1 x_2 x_3 x_4 \bar{x}_5 + \bar{x}_1 \bar{x}_3 \bar{x}_4 +$

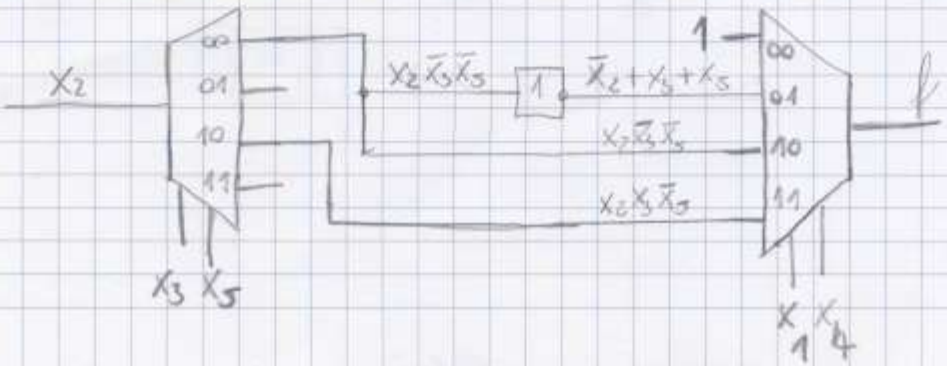
$+ \bar{x}_1 \bar{x}_2 x_4 + \bar{x}_1 \bar{x}_2 x_4 x_5 + \bar{x}_1 x_3 x_4$

ZA IZBIRNA VHODA MULTIPLEKSORJA VZAMEMO $x_1 x_4$ KER SE POJAVLJATA V VSEH ČLENIH

$$x_5(x_2 + \bar{x}_2) + x_2 + x_3$$

$$\bar{x}_1 \bar{x}_4 (x_3 + \bar{x}_3) + \bar{x}_1 x_4 (x_2 x_5 + \bar{x}_2 + \bar{x}_2 x_5 + x_3) + x_1 \bar{x}_4 (x_2 \bar{x}_3 \bar{x}_5) + x_1 x_4 (x_2 x_3 \bar{x}_5)$$

$x_3 + \bar{x}_3 = 1$



By BoB

④

$T_1 = Q_1 Q_3$

$T_2 = Q_3$

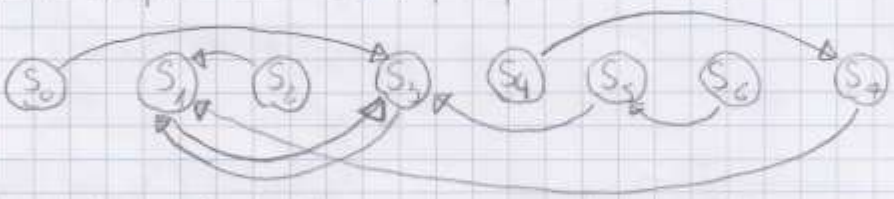
$T_3 = Q_2$

Q_3 je vedno 1, ker ima na vsi priključjeni 1! (GND NEGIRAN)

$Q_{3(n+1)} = 1$

Q_1	Q_2	Q_3	Q_1'	Q_2'	Q_3'	T_1	T_2	T_3
0	0	0	0	1	1	0	1	0
0	0	1	0	1	1	0	1	0
0	1	0	0	0	1	0	1	1
0	1	1	0	0	1	0	1	1
1	0	0	1	1	1	0	1	0
1	0	1	0	1	1	1	1	0
1	1	0	1	0	1	0	1	1
1	1	1	0	0	1	1	1	1

Tako deluje avtomat na sliki!



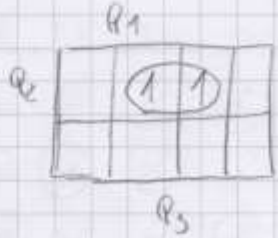
Pravilno delovanje (sinhronski števec po modulu 8)

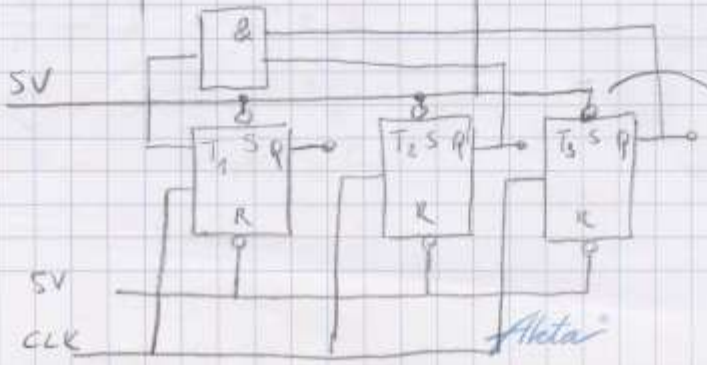
Q_1	Q_2	Q_3	$Q_{1 nov}$	$Q_{2 nov}$	$Q_{3 nov}$	T_1	T_2	T_3
0	0	0	0	0	1	0	0	1
0	0	1	0	1	0	0	1	1
0	1	0	0	1	1	0	0	1
0	1	1	1	0	0	1	1	1
1	0	0	1	0	1	0	0	1
1	0	1	1	1	0	0	1	1
1	1	0	1	1	1	0	0	1
1	1	1	0	0	0	1	1	1

$T_1 = Q_2 Q_3$

$T_2 = Q_3$

$T_3 = 1$





! tud tole na 5V drugače je Q_3 vedno 1!

By BoB

⑤ Združimo kakšna stanja z istim izhodom

Izhod 0:

$S_1, S_3 = (S_1, S_7)$

$S_1, S_6 = \sqrt{}$

$S_1, S_7 = (S_1, S_7), (S_2, S_6), (S_3, S_9)$

$S_3, S_6 = (S_1, S_{10})$

$S_3, S_7 = (S_3, S_9)$ $\sqrt{}$

$S_3, S_9 = \sqrt{}$

$S_6, S_7 = (S_2, S_6)$

$S_6, S_9 = \sqrt{}$

$S_7, S_9 = \sqrt{}$

$S_1 \equiv S_6$

$S_3 \equiv S_7$ $\boxed{S_3 \equiv S_7 \equiv S_9} = S_C$

$S_3 \equiv S_9$ $\boxed{S_1 \equiv S_6} = S_A$

$S_6 \equiv S_9$

$S_7 \equiv S_7$

	00	01	11	10	
S_A	(S_A)	(S_A)	S_B	S_C	0
S_B	S_A	(S_B)	(S_B)	S_D	1
S_C	(S_C)	S_B	S_D	(S_C)	0
S_D	S_C	S_A	(S_D)	(S_D)	1

Izhod 1:

$S_2, S_4 = (S_2, S_6)(S_4, S_8)$

$S_2, S_5 = (S_4, S_7)(S_4, S_8)$

$S_2, S_8 = (S_2, S_{11})$ $\sqrt{}$

$S_2, S_{10} = (S_8, S_{10})$ $\sqrt{}$

$S_2, S_{11} = (S_8, S_{10})$ $\sqrt{}$

$S_4, S_5 = \sqrt{}$

$S_4, S_8 = (S_6, S_{11})$

$S_4, S_{10} = (S_2, S_6)(S_4, S_{10})$

$S_4, S_{11} = (S_2, S_{11})(S_4, S_{10})$

$S_5, S_8 = (S_4, S_8)$

$S_5, S_{10} = (S_4, S_{10})$

$S_5, S_{11} = (S_4, S_7)(S_4, S_{10})$

$S_8, S_{10} = (S_2, S_{11})(S_8, S_{10})$ $\sqrt{}$

$S_8, S_{11} = (S_8, S_{10})$ $\sqrt{}$

$S_{10}, S_{11} = (S_2, S_{11})$ $\sqrt{}$

$S_4 \equiv S_5$

$S_2 \equiv S_8$ $\boxed{S_4 \equiv S_5} = S_D$

$S_2 \equiv S_{10}$

$S_2 \equiv S_{11}$ $\boxed{S_2 \equiv S_8 \equiv S_{10} \equiv S_{11}}$

$S_8 \equiv S_{10}$ $\Vert$

$S_8 \equiv S_{11}$ S_B

$S_{10} \equiv S_{11}$