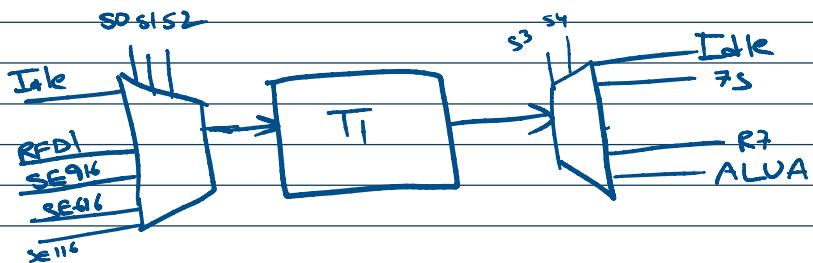


Control

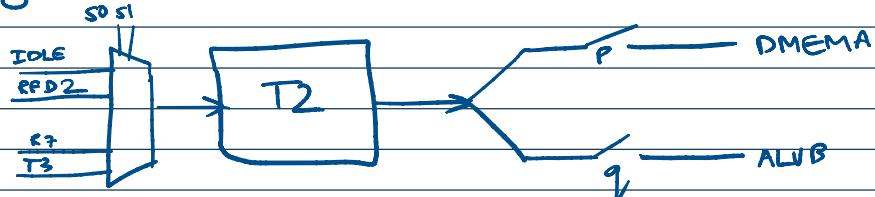
17 April 2022 18:43



a \ bc	00	01	11	10
0	0000	11000	00100	00001
1	0000	10000	00011	00100

$$\begin{aligned}
 S0 &\rightarrow \bar{a}b\bar{c} + a\bar{b}c \\
 S1 &\rightarrow b\bar{c} \\
 S2 &\rightarrow a\bar{b}\bar{c} \\
 S3 &\rightarrow a\bar{b}\bar{c} + \bar{a}b\bar{c} \\
 S4 &\rightarrow \bar{b}\bar{c}
 \end{aligned}$$

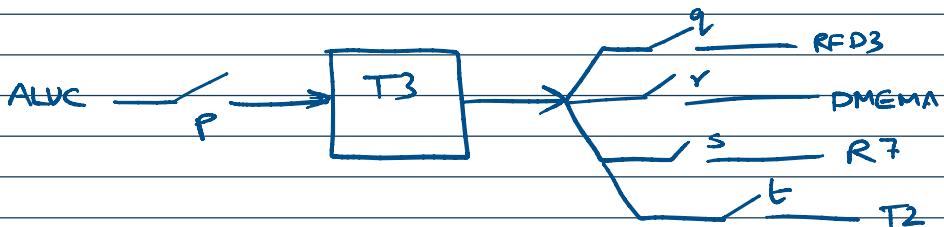
T2 (given) \rightarrow 3 bits abc



c \ ab	00	01	11	10
0	00	00	00	01
1	10	X	00	11

$S0 \rightarrow a\bar{b}$
 $S1 \rightarrow \bar{b}c$
 $q \rightarrow b\bar{c}$
 $p \rightarrow ab$

T3 \rightarrow 3 bits abc



c \ ab	00	01	11	10
0	Idle	X	R	q
1				

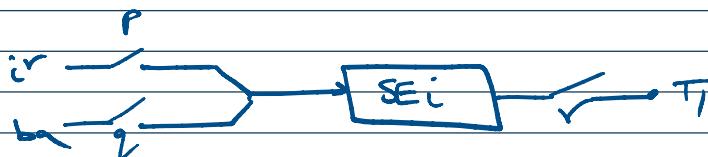
$P \rightarrow ac$
 $q \rightarrow ab$
 $r \rightarrow b\bar{c}$

0	idle	X	r	q	
1	s	t	p	x	

$$\begin{aligned} q &\rightarrow ab \\ r &\rightarrow b\bar{c} \\ s &\rightarrow \bar{b}c \\ t &\rightarrow \bar{a}\bar{b} \end{aligned}$$

7S \rightarrow only 1 control bit needed

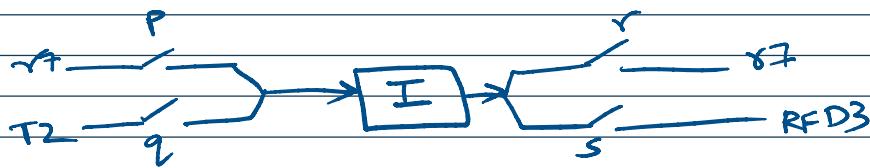
SE_i \rightarrow 2 bits ab



a	b	0	idle	p	r	
0	0	idle	p	r	q	
1	x	x	x	x	x	

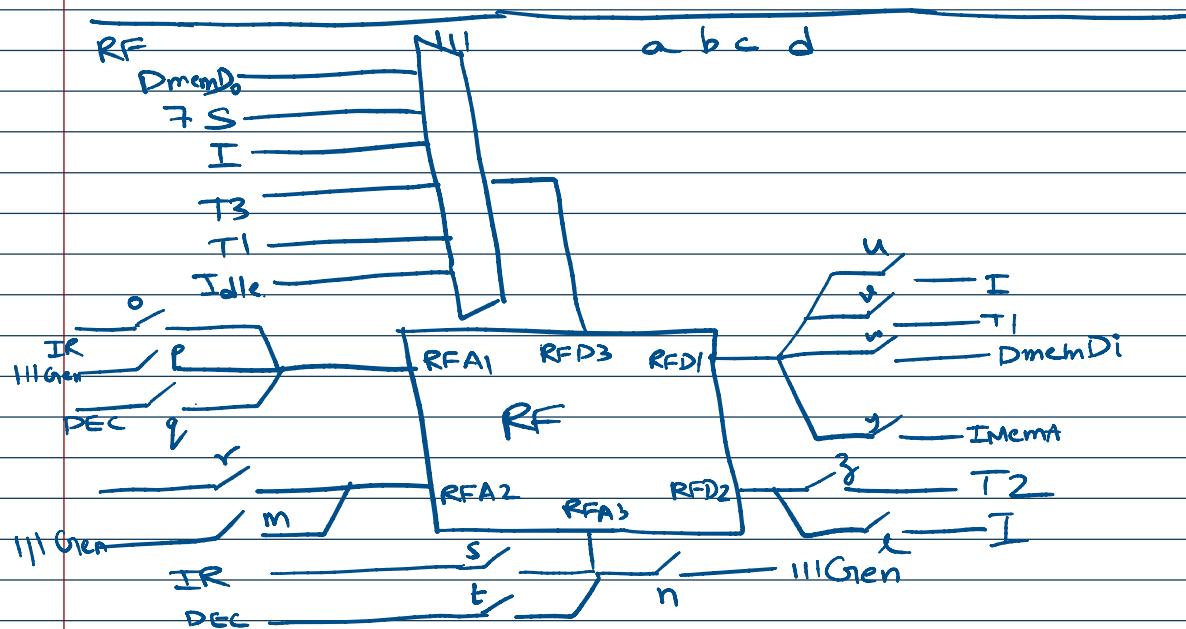
$$\begin{aligned} p &\rightarrow \bar{a}\bar{b} \\ q &\rightarrow ab \\ r &\rightarrow a+b \end{aligned}$$

I \rightarrow 3 bits abc



c	ab	00	01	11	10	
0	idle	p	r	q	x	
1	s	x	x	x	x	

$$\begin{aligned} p &\rightarrow \bar{a}\bar{b} \\ r &\rightarrow ab \\ q &\rightarrow ab \\ s &\rightarrow c \end{aligned}$$



$I \rightarrow R_1; IR \rightarrow RFA_1; IR \rightarrow RFA_2; RFD_1 \rightarrow T_1; RFD_2 \rightarrow T_2$

T3 → RRP3; E α → RFA3

R7 → InvertA,I -

$I \rightarrow RF$ -

I → R7; IR → RFA1; RFDI → Π

R7 → I /

IR → RFA3 ; DmemD0 → RF D3'

$\text{IR} \rightarrow \text{RFA1}$; $\text{RF DI} \rightarrow \text{Dmem}$

$R^7 \rightarrow I, T_2 /$

$I \rightarrow RF D_3$; $IR \rightarrow A_1, A_2, A_3$; $RF D_2 \rightarrow T_2$; $RF D_1 \rightarrow \Pi$ /

T3 → R7 /

RFAI → IR ; RFD → TI ; R7 → T ,

$R \mathcal{F} \rightarrow \text{Im}_m A'$

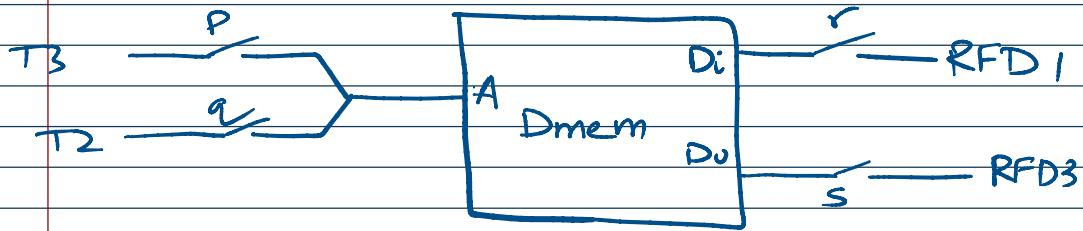
$\text{Pec} \rightarrow \text{RFAl}$; $\text{RFAl} \rightarrow \text{DmemDi}$

$\text{Dec} \rightarrow \text{RFA3} : \text{PmemDo} \rightarrow \text{RFD3}$

		ab	cd		
		00	01	11	10
ab	00	00 av	01; no rvz	01 n	000 py'
01	01 n av	pu 000	001 s	100 s	
11	000 0w	000 puv	01 s o vz	n vz	100
10	000 vml	py 000	-	000 v w	001 E

$S_0 \rightarrow \bar{a}cd + bcd + \bar{a}\bar{b}\bar{c}\bar{d} + \bar{a}\bar{b}\bar{d}$
 $S_1 \rightarrow \bar{a}bcd + \bar{a}\bar{b}cd + abc\bar{d}$
 $S_2 \rightarrow b\bar{c}\bar{d}$
 $\ell, m \rightarrow a\bar{b}\bar{c}\bar{d}$
 $n \rightarrow \bar{a}\bar{b}\bar{d} + \bar{a}b\bar{c}\bar{d} + ab\bar{c}\bar{d}$
 $\Theta \rightarrow b\bar{c}\bar{d} + a\bar{c}\bar{d} + a\bar{b}\bar{c}\bar{d} + abc\bar{d}$
 $p \rightarrow bcd + a\bar{c}d + \bar{a}\bar{b}cd$
 $q \rightarrow abcd$
 $r \rightarrow abcd + \bar{a}\bar{b}\bar{c}\bar{d}$
 $s \rightarrow \bar{a}bc + bcd$
 $t \rightarrow a\bar{b}\bar{c}\bar{d}$
 $u \rightarrow \bar{b}\bar{c}\bar{d}$
 $v \rightarrow \bar{a}\bar{b}\bar{c}\bar{d} + \bar{a}\bar{b}\bar{c}\bar{d} + ab\bar{c}\bar{d} + \bar{a}\bar{b}\bar{d}$
 $w \rightarrow ab\bar{c}\bar{d} + \bar{a}\bar{b}cd$
 $x \rightarrow \bar{a}\bar{b}cd + \bar{a}\bar{b}cd$
 $y \rightarrow \bar{a}\bar{b}\bar{c}\bar{d}$

Dmem — 2 bits ab



$T_3 \rightarrow D_{mem}A$; $D_{mem}D_o \rightarrow RFD_3$

$T_3 \rightarrow D_{mem}A$; $RFD_1 \rightarrow D_{mem}D_i$

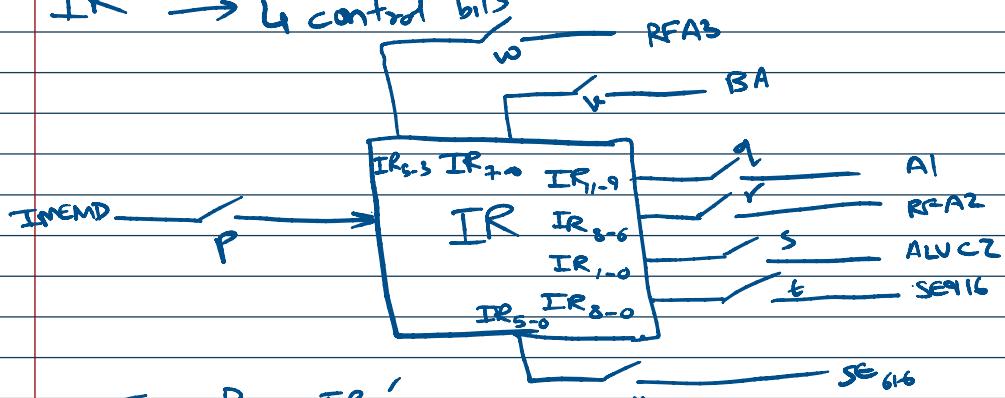
$T_2 \rightarrow D_{mem}A$; $RFD_1 \rightarrow D_{mem}D_i$

a\b	0	1
0	i&k	P s
1	P r	q

$$\begin{aligned} p &\rightarrow a\bar{b} + b\bar{a} \\ q &\rightarrow ab \\ r &\rightarrow a \\ s &\rightarrow \bar{a}\bar{b} \end{aligned}$$

IMEM → Only 1 control bit needed;

IR → 4 control bits



$IMEMD \rightarrow IR'$
 IR_{11-9}, IR_{8-6}
 $IR_{1-0} \rightarrow ALUC2$
 $IR_{5-3} \rightarrow RFA3$
 IR_{5-0}
 IR_{4-6}
 IR_{8-0}
 IR_{11-9}

cd

ab	00	01	11	10	
00	idle	P	S	q	r
01	w	u	t	s	r

Outputs:

- $p \rightarrow \bar{a}\bar{b}\bar{c}\bar{d}$
- $d \rightarrow \bar{a}\bar{b}c\bar{d} + a\bar{b}\bar{c}\bar{d}$
- $c \rightarrow cd$
- $s \rightarrow \bar{a}\bar{b}cd$
- $t \rightarrow \bar{a}bcd$
- $u \rightarrow ab\bar{c}\bar{d}$
- $r \rightarrow \bar{a}\bar{b}\bar{c}\bar{d}$

\sim	\sim	\sim	\sim	\sim	\sim	$t \rightarrow abcd$
11	g	v	x	x	x	$u \rightarrow \bar{a}b\bar{c}d$
10	x	x	x	x	x	$v \rightarrow a\bar{b}\bar{c}d$
						$w \rightarrow \bar{a}b\bar{c}\bar{d}$

CW →

