

Ardışıl Devre Tasarımı

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sözel problem tanımı
↓
Durum diyagramı
↓
Ardışıl devre

Ardışıl Devre Analizi

↓
Devre var
↓
Durum geçiş diyagramı

FF Tanım Bağlantısı

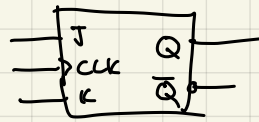
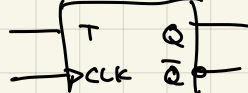
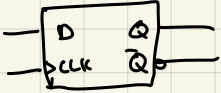
FF Ters tanım bağlantısı

DFF

q: önceki
Q: sonraki

TFF

JK FF



CLK	D	Q
↑	0	0
↑	1	1
diğer	X	q

CLK	T	Q
↑	0	q
↑	1	\bar{q}
diğer	X	q

CLK	J	K	Q
↑	0	0	q
↑	0	1	0
↑	1	0	1
↑	1	1	\bar{q}
diğer	X	X	q

sonraki durum
önceki

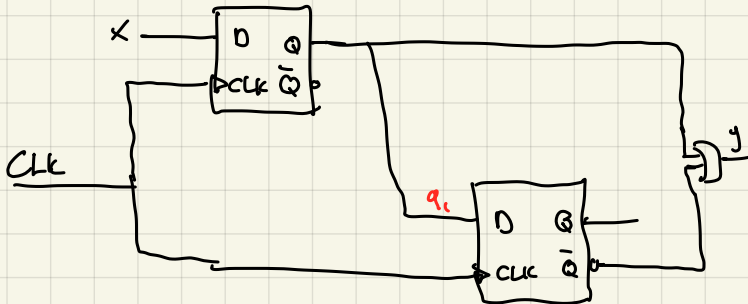
q	Q	D
0	0	0
0	1	1
1	0	0
1	1	1

q	Q	T
0	0	0
0	1	1
1	0	1
1	1	0

q	Q	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

Tüm verilerin elemanları

Senkron → Aynı CLK
Asenkron → farklı CLK girişleri



X	q ₁	q ₂	Q ₁	Q ₂	y = q ₁ + q ₂
0	0	0	0	0	1
0	0	1	0	0	0
0	1	0	0	1	1
0	1	1	0	1	1
1	0	0	1	0	1
1	0	1	1	0	0
1	1	0	1	1	0
1	1	1	1	1	1

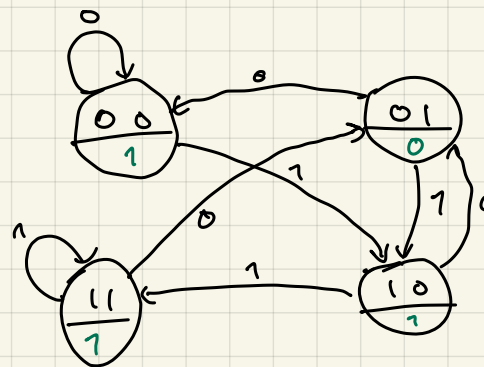
Moore

Mealy

$f(q_i)$

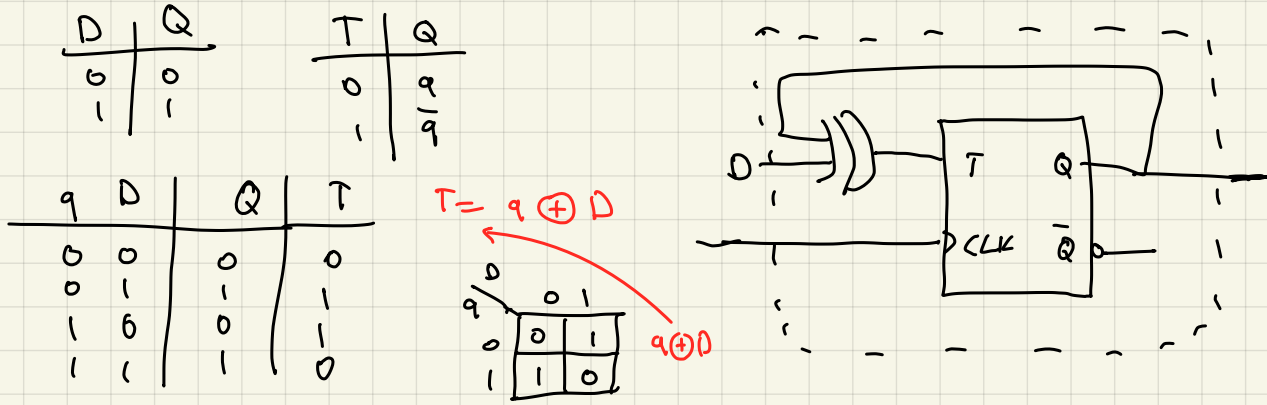
$f(x_i, q_i)$

Cukları sadece duruma bağlı
eğer girisi bağlı da olsa

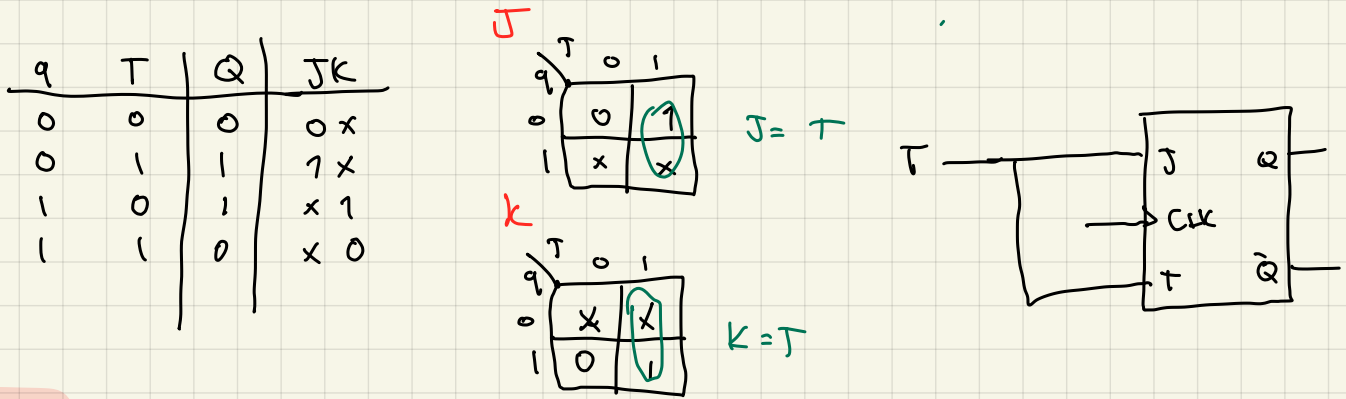


Moore
Makinesi

T FF kullanarak DFF gerçekleştiriniz



JKff kullanarak TFF Gerçekleştiriniz.

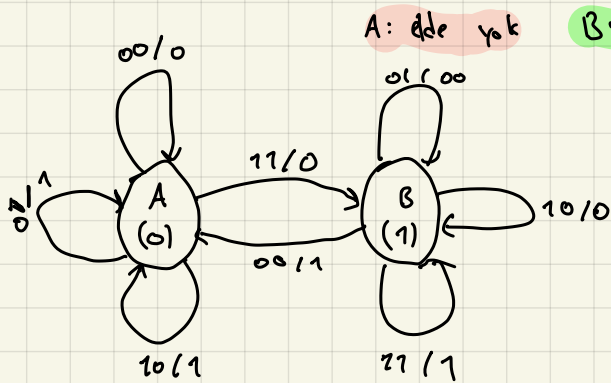


Örnek

$(X_n \dots X_1 X_0)_2$
 $(Y_n \dots Y_1 Y_0)_2$

bu sayıların senkron geldiğini varsayarak bu sayıların toplamını DFF kullanarak gerçekleyiniz.

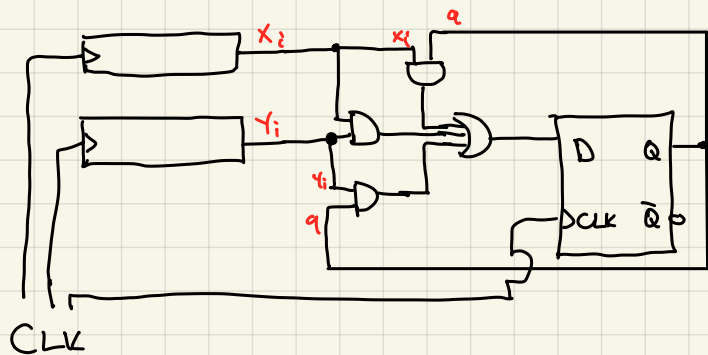
Kaç giriş var? $\rightarrow 2$ (X_i, Y_i)
 kaç farklı durum var? $\rightarrow 1$ elde $\rightarrow 1$ 1FF yeterli.
 Durum diyagramı nasıl?
 Mealy mi Moore mu? \rightarrow Mealy



X_i	Y_i	q	Q	Z	D
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	1	0
0	1	1	1	0	1
1	0	0	0	1	0
1	0	1	1	0	1
1	1	0	1	0	1
1	1	1	1	1	1

X_i, Y_i	q	0	1
00	0	0	0
01	0	0	1
11	0	1	1
10	0	0	1

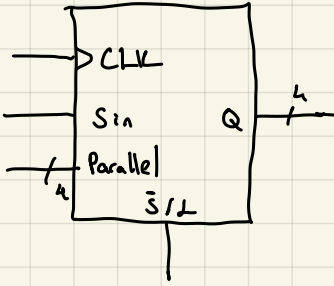
$X_i, Y_i + q, Y_i + q, X_i$



Register (Yazma)

Seri ve Paralel yazmaları gördük

Parallel Access Shift Register



CLK	\bar{S}/L	$Q(Q_3, Q_2, Q_1, Q_0)$
	$\bar{S}/L = 1$	$P_3 P_2 P_1 P_0$
	$\bar{S}/L = 0$	Sin, q_3, q_2, q_1 (sağ öteleme)

Shift ya da load olduğunu anlıyoruz

Senkron Asenkron Sayıcı gördük

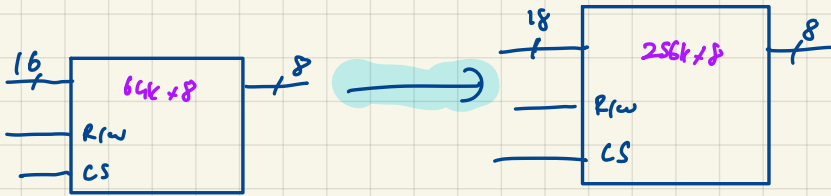
ROM PAL PLA örnekleri
Slaytta

Making Larger Memories

ÖR $64k \times 8$ kapasitesindeki SRAM bloklarını kullanarak $256k \times 8$ kapasitesindeki RAM bloğunu tasarlıyoruz.

$$64k = 64 \cdot 2^{10} = 2^{16}$$

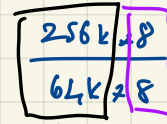
$A_0 - A_{15} \rightarrow 16$ adres ucu
 $D_0 - D_7 \rightarrow 8$ data



$$(\log_2 256k) = 2^8 \cdot 2^{10} = 2^{18}$$

Kaç SRAM gerekir?

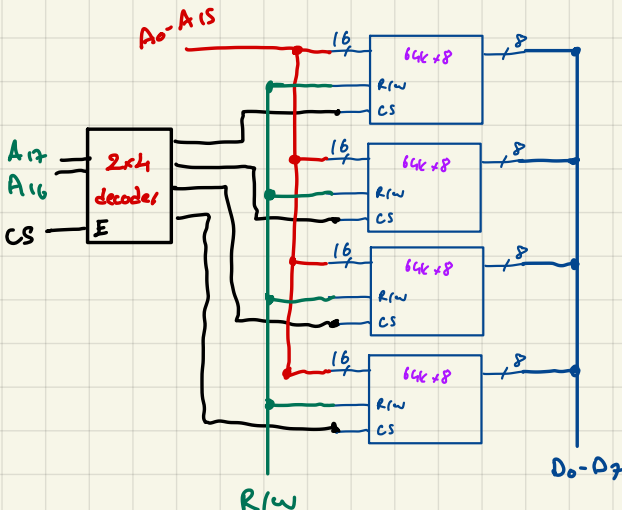
Veri yolu genişletmeye ihtiyac yok



4 adet SRAM'i kapasite genişletme yönünde kullanmalıyız.

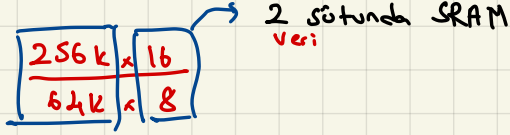
Bu 4 blok aynı anda seçilmemeli

2x4 decoder

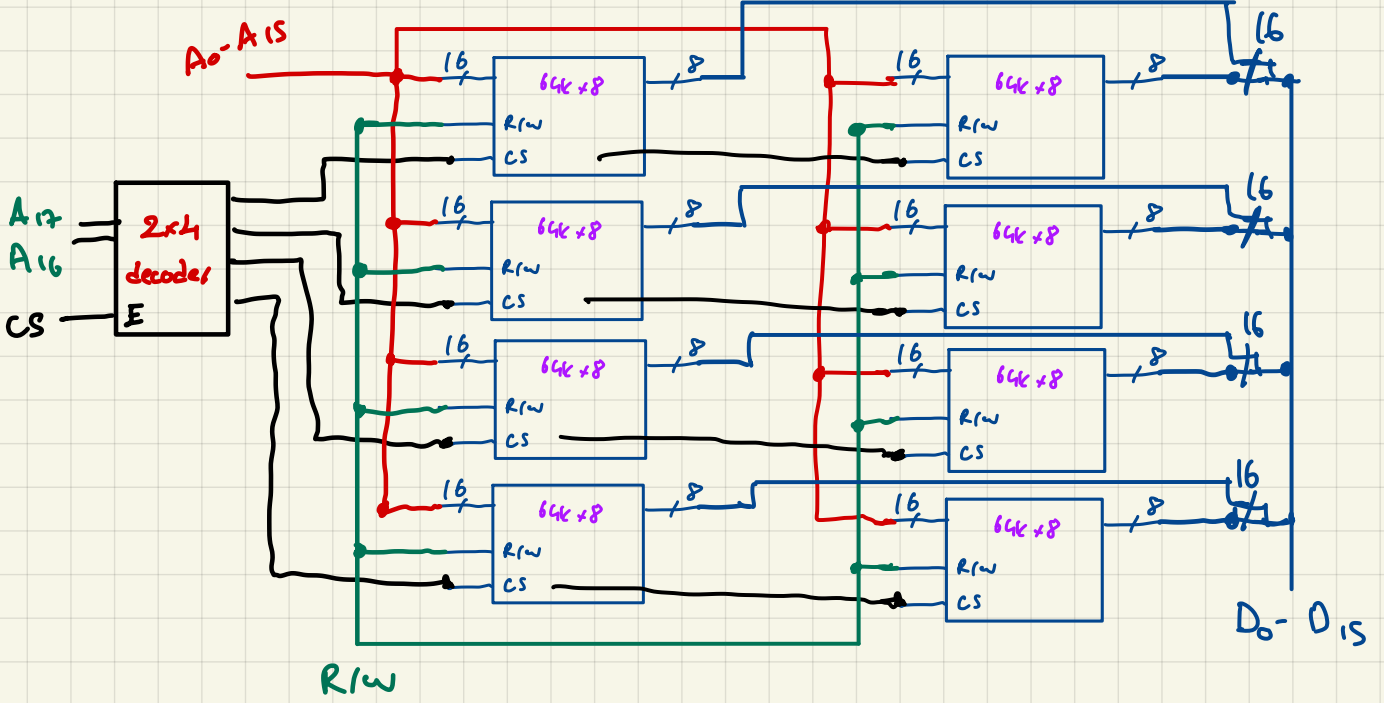


ÖRNEK

64x8 SRAM bloklarını kullanarak 256x16'lık kapasiteli RAM bloğu tasarlayınız.



4 satırda SRAM
Kapasite genişletme

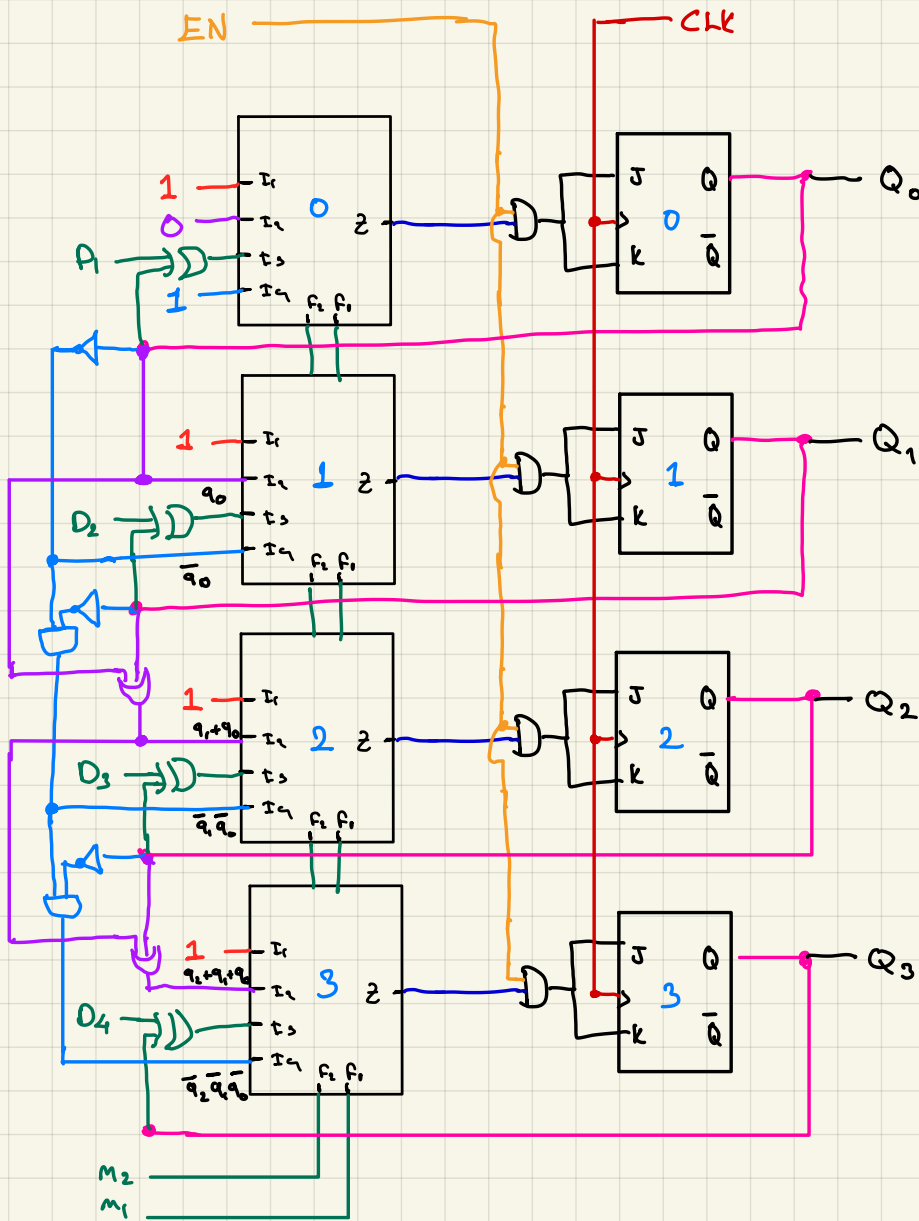


ÖDEV

1. Soru Cevabı ↓

Muhammad Nosir Sabir
19011904

[Handwritten signature]



I₂

q_3	q_2	q_1	q_0	Q_3	Q_2	Q_1	Q_0	JK_3	JK_2	JK_1	JK_0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1	1	0
0	0	1	0	1	1	1	0	1	1	0	0
0	0	1	1	1	1	0	1	1	1	0	0
0	1	0	0	1	1	0	0	1	0	0	0
0	1	0	1	1	0	1	1	1	1	0	0
0	1	1	0	1	0	1	0	1	1	0	0
0	1	1	1	1	0	0	1	1	1	0	0
1	0	0	0	1	0	0	0	0	0	0	0
1	0	0	1	0	1	1	1	1	1	1	0
1	0	1	0	0	1	1	0	1	1	0	0
1	0	1	1	0	1	0	1	1	1	0	0
1	1	0	0	0	1	0	0	1	0	0	0
1	1	0	1	0	0	1	1	1	1	0	0
1	1	1	0	0	0	1	0	1	1	0	0
1	1	1	1	0	0	0	1	1	1	1	0

JK₃

$q_3 q_2$	00	01	11	10
00	0	1	1	1
01	1	1	1	1
11	1	1	1	1
10	0	1	1	1

$q_2 + q_1 + q_0$

JK₂

$q_3 q_2$	00	01	11	10
00	0	1	1	1
01	0	1	1	1
11	0	1	1	1
10	0	1	1	1

$q_1 + q_0$

JK₁

$q_3 q_2$	00	01	11	10
00	0	1	1	0
01	0	1	1	0
11	0	1	1	0
10	0	1	1	0

q_0

JK₀

$q_3 q_2$	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	0	0	0	0
10	0	0	0	0

0

I₃

D _i	q	Q	JK
0	0	0	0x → 0
0	1	0	1x → 1
1	0	1	x1 → 1
1	1	1	x0 → 0

JK = D_i ⊕ q

don't care durumlarını
yanındaki giriş neyse ona
göre aldım

Muhammad Nasir Sabir
19011904

(Signature)

I₄

q ₃ q ₂ q ₁ q ₀	Q ₃ Q ₂ Q ₁ Q ₀	JK ₃	JK ₂	JK ₁	JK ₀
0 0 0 0	1 1 1 1	1	1	1	1
0 0 0 1	0 0 0 0	0	0	0	1
0 0 1 0	0 0 0 1	0	0	1	1
0 0 1 1	0 0 1 0	0	0	0	1
0 1 0 0	0 0 1 1	0	1	1	1
0 1 0 1	0 1 0 0	0	0	0	1
0 1 1 0	0 1 0 1	0	0	1	1
0 1 1 1	0 1 1 0	0	0	0	1
1 0 0 0	0 1 1 1	1	1	1	1
1 0 0 1	1 0 0 0	0	0	0	1
1 0 1 0	1 0 0 1	0	0	1	1
1 0 1 1	1 0 1 0	0	0	0	1
1 1 0 0	1 0 1 1	0	1	1	1
1 1 0 1	1 1 0 0	0	0	0	1
1 1 1 0	1 1 0 1	0	0	1	1
1 1 1 1	1 1 1 0	0	0	0	1

JK₃

q ₃ q ₂	00	01	11	10
00	1			
01				
11				
10	1			

$$JK_3 = \overline{q_2} \overline{q_1} \overline{q_0}$$

JK₂

q ₃ q ₂	00	01	11	10
00	1			
01	1			
11	1			
10	1			

$$JK_2 = \overline{q_1} \overline{q_0}$$

JK₁

q ₃ q ₂	00	01	11	10
00	1			1
01	1			1
11	1			1
10	1			1

$$JK_1 = \overline{q_0}$$

JK₀

q ₃ q ₂	00	01	11	10
00	1	1	1	1
01	1	1	1	1
11	1	1	1	1
10	1	1	1	1

$$JK_0 = 1$$

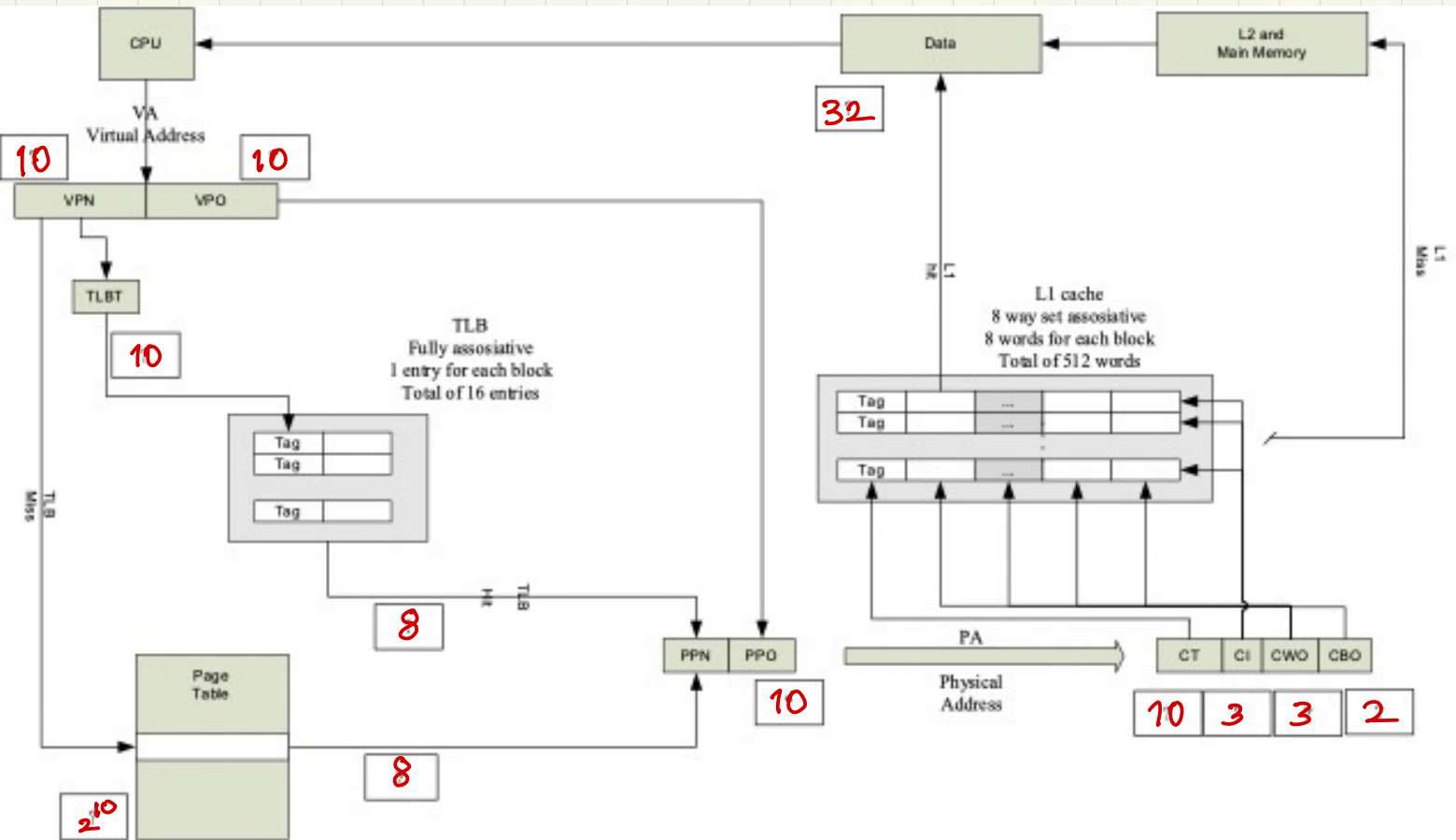
SORU 1

Page Size : 1KB

Virtual Address : 20 bit

Data width: 32 bit

Physical Address : 18 bit



$1k = 2^{10} \rightarrow 10 \text{ bit} \rightarrow \text{VPO}$
 $20 - 10 = 10 \rightarrow \text{VPN}$

way \times words each block
 $8 \times 8 = 64 \text{ word}$ bir satırda

$\frac{512}{64} = 8 \text{ satır}$
 $\rightarrow \log_2 8 = 3 \text{ bit index}$ için

Data width / words = word genişliği
 $32 / 8 = 4 \text{ byte}$

$\log_2 4 = 2 \text{ bit}$ \rightarrow byte için offset
 $\log_2 8 = 3 \text{ bit}$ \rightarrow word için offset

M.NASIR SABIR
 19011904

[Signature]

Physical Address - Index - word Offset - byte Offset
 $18 - 3 - 3 - 2 = 10 \text{ bit}$ tag alanı