گیت‌های ترکیبی

not , NOR , OR , And ...

x	y	...
0	0	.
0	1	.
1	0	.
1	1	.

x	y	And	or	Xor	nor	nand
0	0	0	0	0	1	1
0	1	0	1	1	0	1
1	0	0	1	1	0	1
1	1	1	1	0	0	0

nor ← not + or , $\overline{x}$

nor $\{ F = \overline{x+y}$ ← $x \to$ OR $\to F$, $y \to$ OR $\to F$

nand $\{ F = \overline{x.y}$ ← $x \to$ AND, $y \to$ AND $\to F$

$x.\overline{x} = 0$

$x.x = x$

$x.1 = x$

$x.0 = 0$

$x + \overline{x} = 1$

$x + x = x$

$x + 1 = 1$

$x + 0 = x$

$x \oplus \overline{x} = 1$

$x \oplus x = 0$

$x \oplus 1 = \overline{x}$

$x \oplus 0 = x$

$\overline{x+y} = \overline{x}.\overline{y}$, $\overline{x.y} = \overline{x} + \overline{y}$

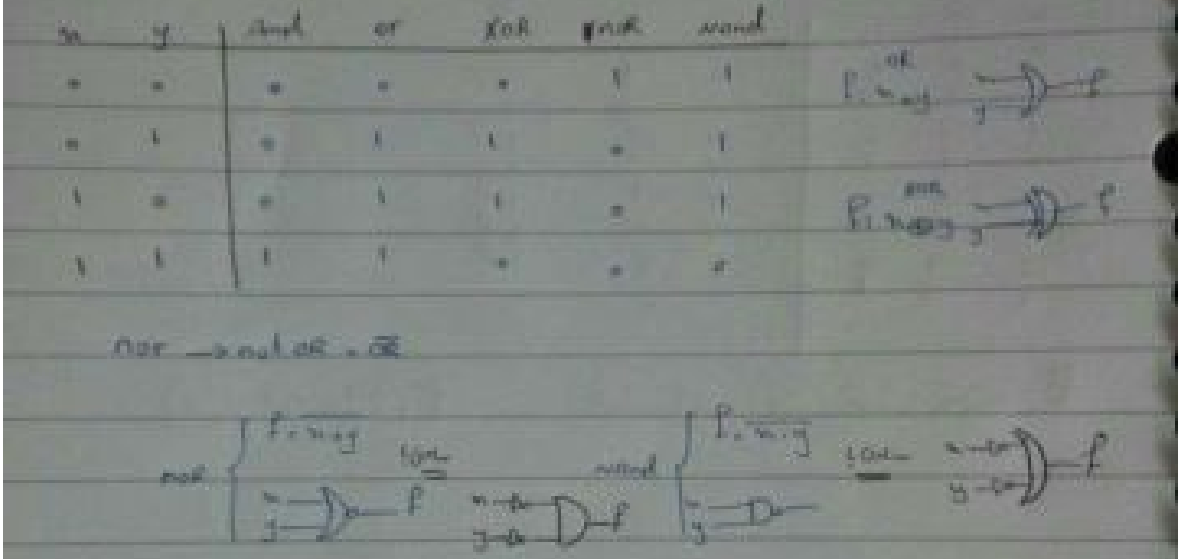
TAT

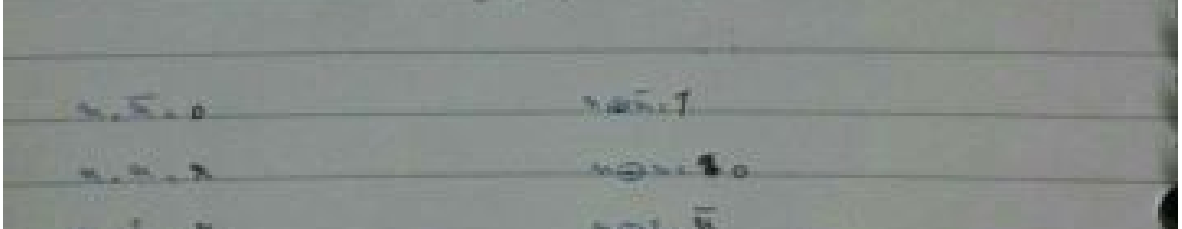
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گیت‌های گیت

not , XOR , OR , And

x	y	And	or	XOR	nor	nand
0	0	0	0	0	1	1
0	1	0	1	1	0	1
1	0	0	1	1	0	1
1	1	1	1	0	0	0





$x \cdot \bar{x} = 0$

$x \cdot x = x$

$x \cdot 1 = x$

$x \cdot 0 = 0$

$x + \bar{x} = 1$

$x + x = x$

$x + 1 = 1$

$x + 0 = x$

$x \oplus \bar{x} = 1$

$x \oplus x = 0$

$x \oplus 1 = \bar{x}$

$x \oplus 0 = x$

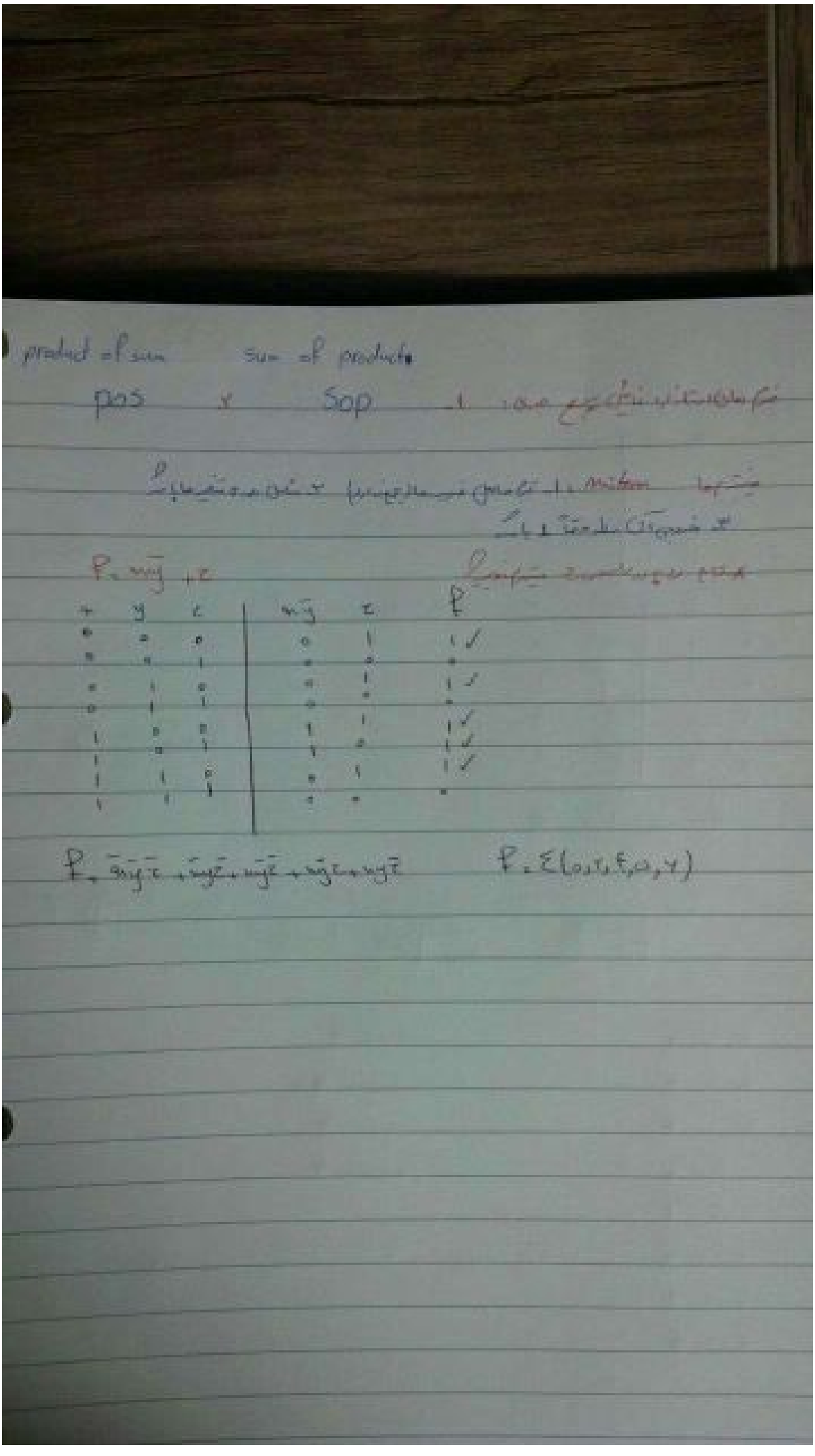
$\overline{x+y} = \bar{x} \cdot \bar{y}$ ، $\overline{x \cdot y} = \bar{x} + \bar{y}$

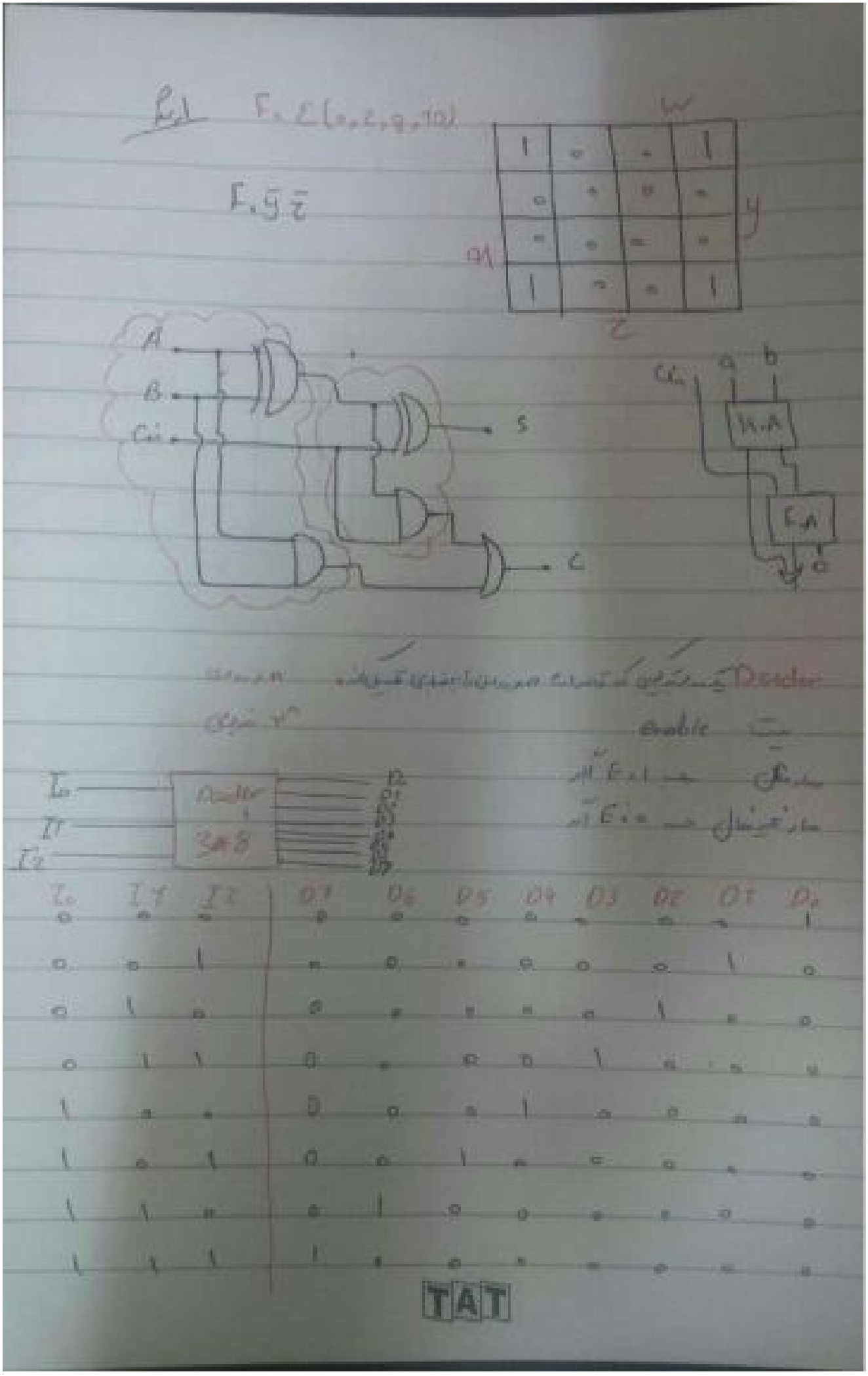
TAT

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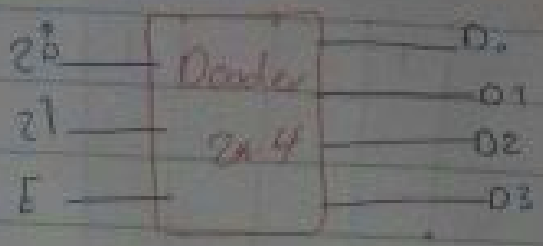
product of sum sum of products

pos x sop ←

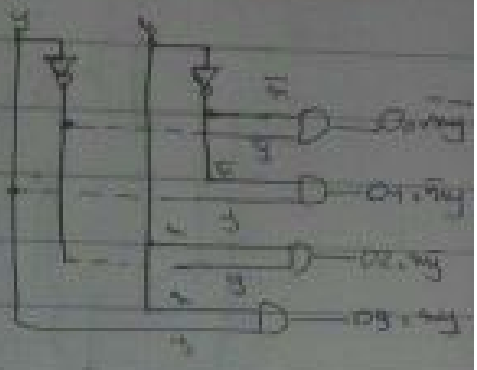




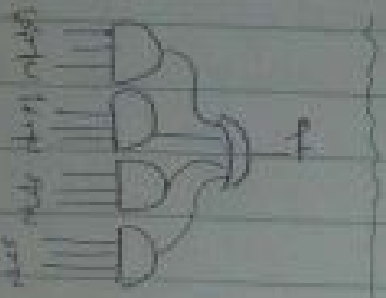
Scanned by CamScanner

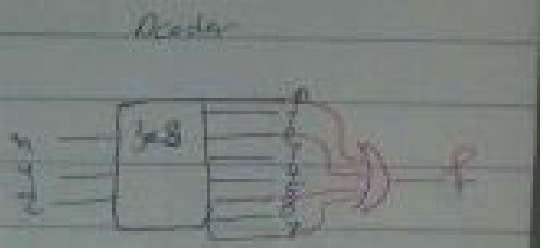






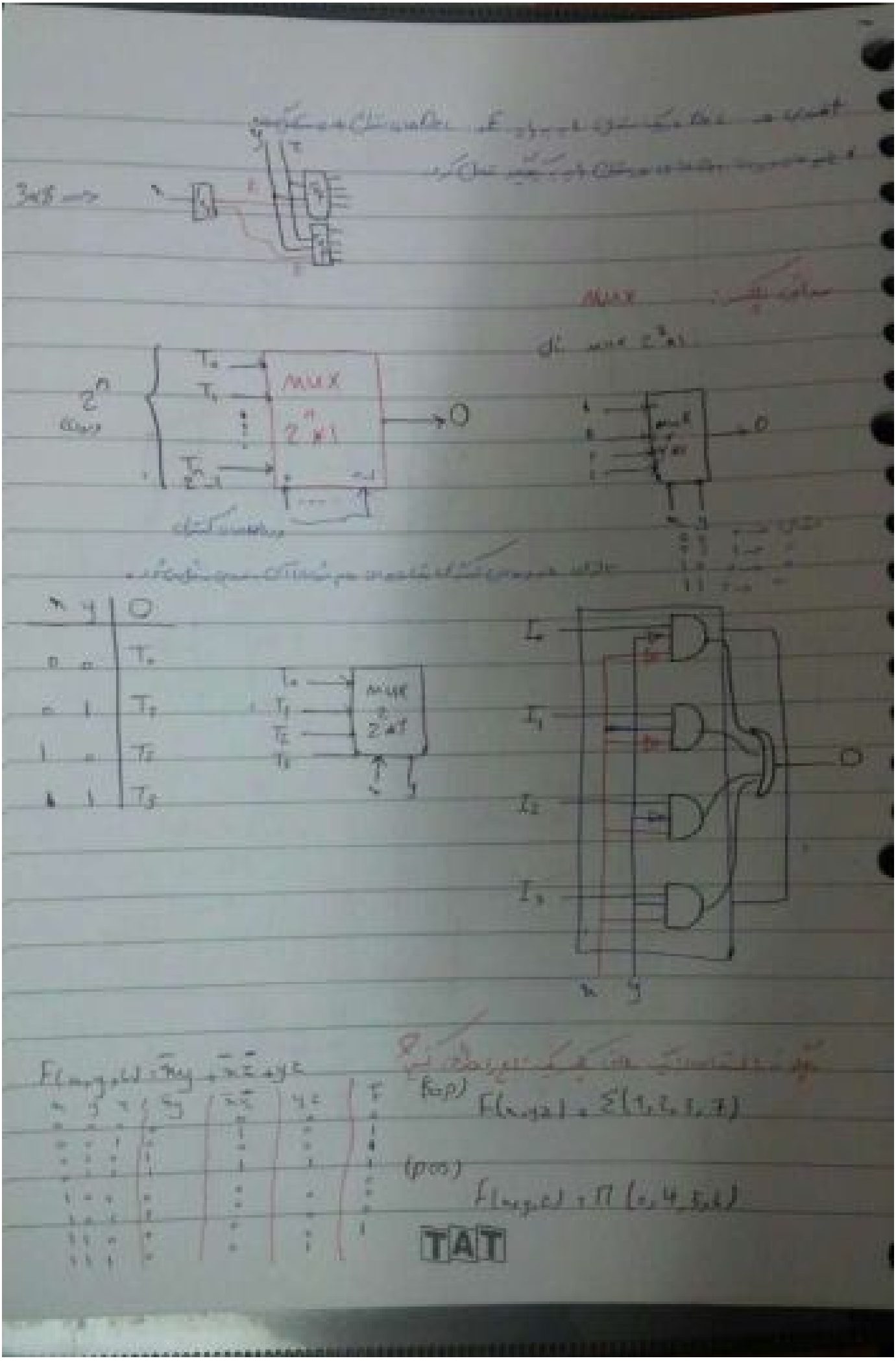
$F(x,y,z) = \Sigma(0,2,5,7)$



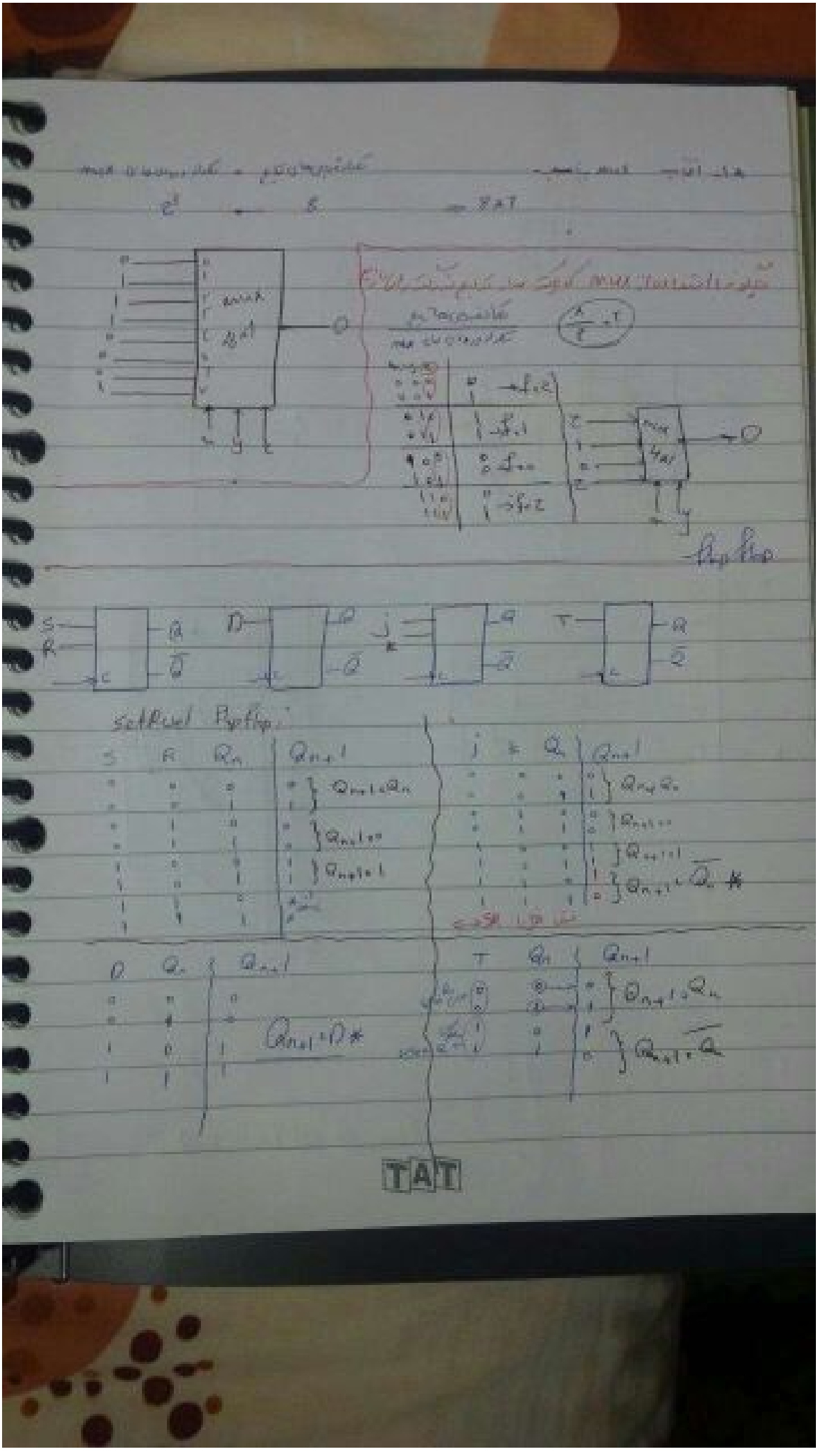


TAT

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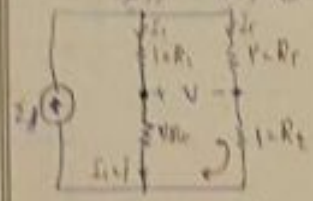


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۴- جریان‌های شکل زیر ولتاژ V و جریان I را بدست آورید.



$$I_1 = \frac{R_2+R_3}{(R_1+R_2)+(R_2+R_3)} I_3 = \frac{2+1}{(1+2)+(2+1)} \times 2 \times \frac{2}{3} \times 4$$

$$= \frac{1}{2} \times 4 \Rightarrow I_1 = 2$$ ✓

$$I_2 = \frac{R_1+R_2}{(R_2+R_3)+(R_1+R_2)} I_3 = \frac{1+2}{(2+1)+(1+2)} \times 2 \times \frac{2}{3} \times 4$$

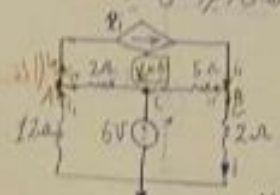
$$I_2 = 2$$ ✓

$$KVL \Rightarrow V - I_1 R_2 + I_2 R_3 = 0$$

$$V = I_1 R_2 - I_2 R_3 = (4 \times 2) - (2 \times 1)$$

$$\Rightarrow V = 2$$ ✓

۳- به دو روش تحلیل گره، جریان‌های زیر را حل کنید.



$$KCL_A \Rightarrow I_1 = I_2 + I_3$$

$$\frac{V_A}{12} = \frac{V_A - V_C}{2} + \frac{V_A - 6}{2}$$

$$\frac{V_A}{12} = \frac{V_A - 2 + 4}{2}$$

$$\frac{V_A}{12} = \frac{V_A - 2}{2} \Rightarrow 2V_A = 12V_A - 24$$

$$\Rightarrow 24 = 10V_A \Rightarrow V_A = 2/4$$ ✓

$$KCL_B \Rightarrow I_1 = I_2 + I_3 \Rightarrow 2 = \frac{V_B - V_C}{R} + \frac{V_B}{R}$$

$$2 = \frac{V_B - 6}{5} + \frac{V_B}{2} \Rightarrow 2 = \frac{2V_B - 12 + 5V_B}{10}$$

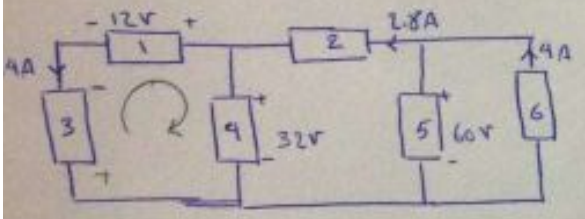
$$2 = \frac{7V_B - 12}{10} \Rightarrow 20 = 7V_B - 12$$

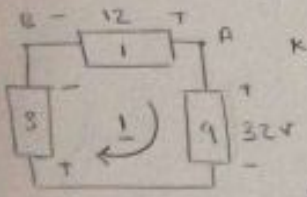
$$7V_B = 32 \Rightarrow V_B = 4/5$$ ✓

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احسن دهنا برای مدرت: تمرین ۱

۱- در شکل زیر ولتاژ و جریان شاخه‌ها را به دست آورید و نشان دهید توان عنصر فعال و توان عنصر غیر فعال است. بیشتر همه اصل بقای توان برقرار است

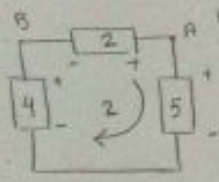




KVL : $32 + V_3 - 12 = 0$

$20 + V_3 = 0$

$V_3 = -20(V)$ ولتاژ

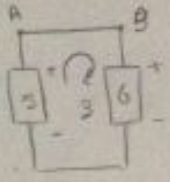


KVL:

$60 - 32 - V_2 = 0$

$28 - V_2 = 0$

$V_2 = 28V$ ولتاژ



KVL:

$-60 + V_6 = 0$

$V_6 = -60(V)$ ولتاژ

$P = VI$

$P_1 = (-12) \times (2.4) = -28.8$

$P_3 = (-20) \times (2.4) = -48$

$P_4 = (32) \times (2.4) = 76.8$

$P_1 + P_3 + P_4 = 0$ ✓ مجموع جبری توان‌ها صفر

$P_2 = (-28) \times (2.8) = -78.4$

$P_5 = 60 \times 2.8 = 168$

$P_6 = (32) \times (2.8) = -89.6$

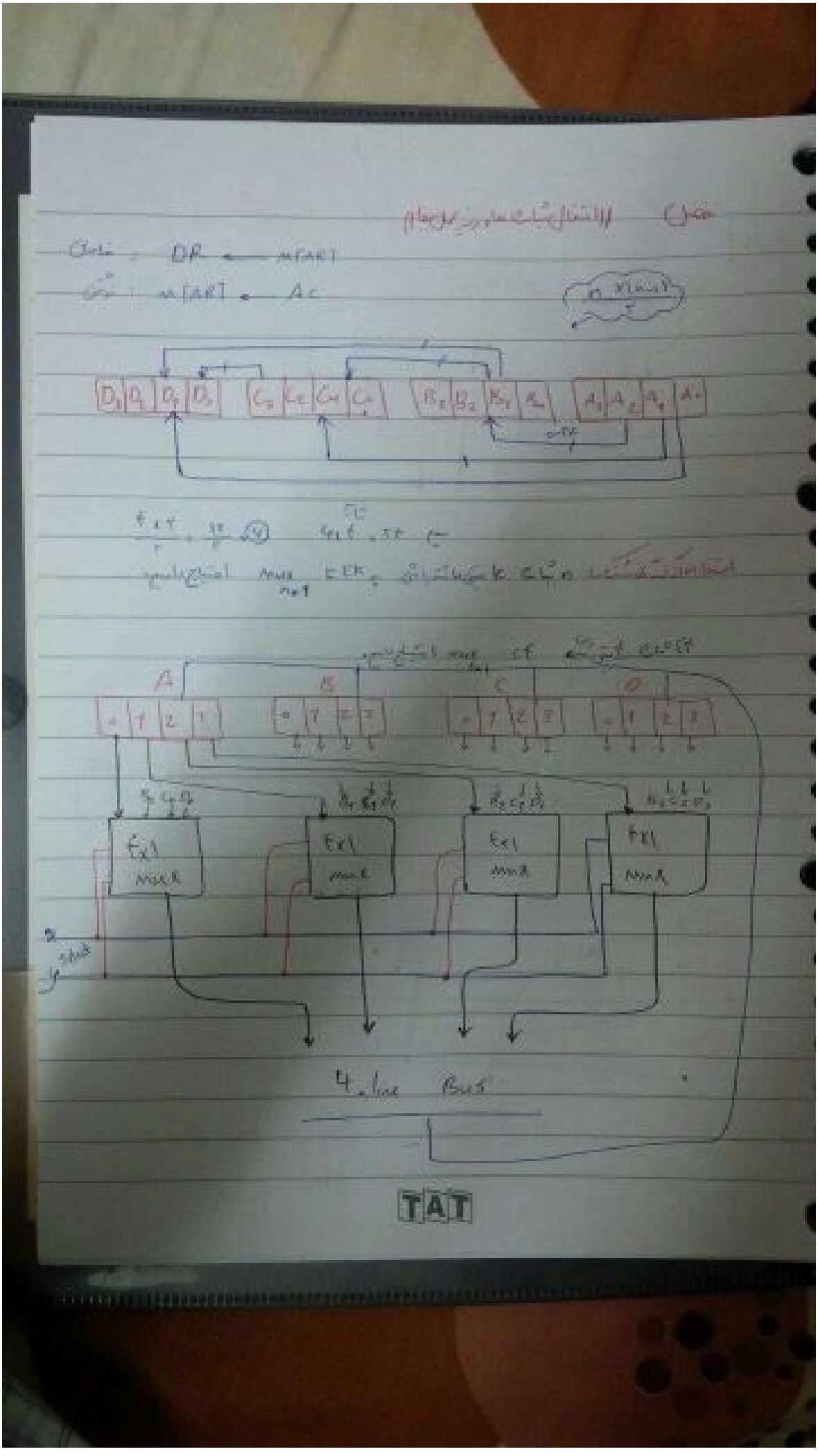
$P_2 + P_5 + P_6 = 0$ مجموع جبری توان‌ها صفر

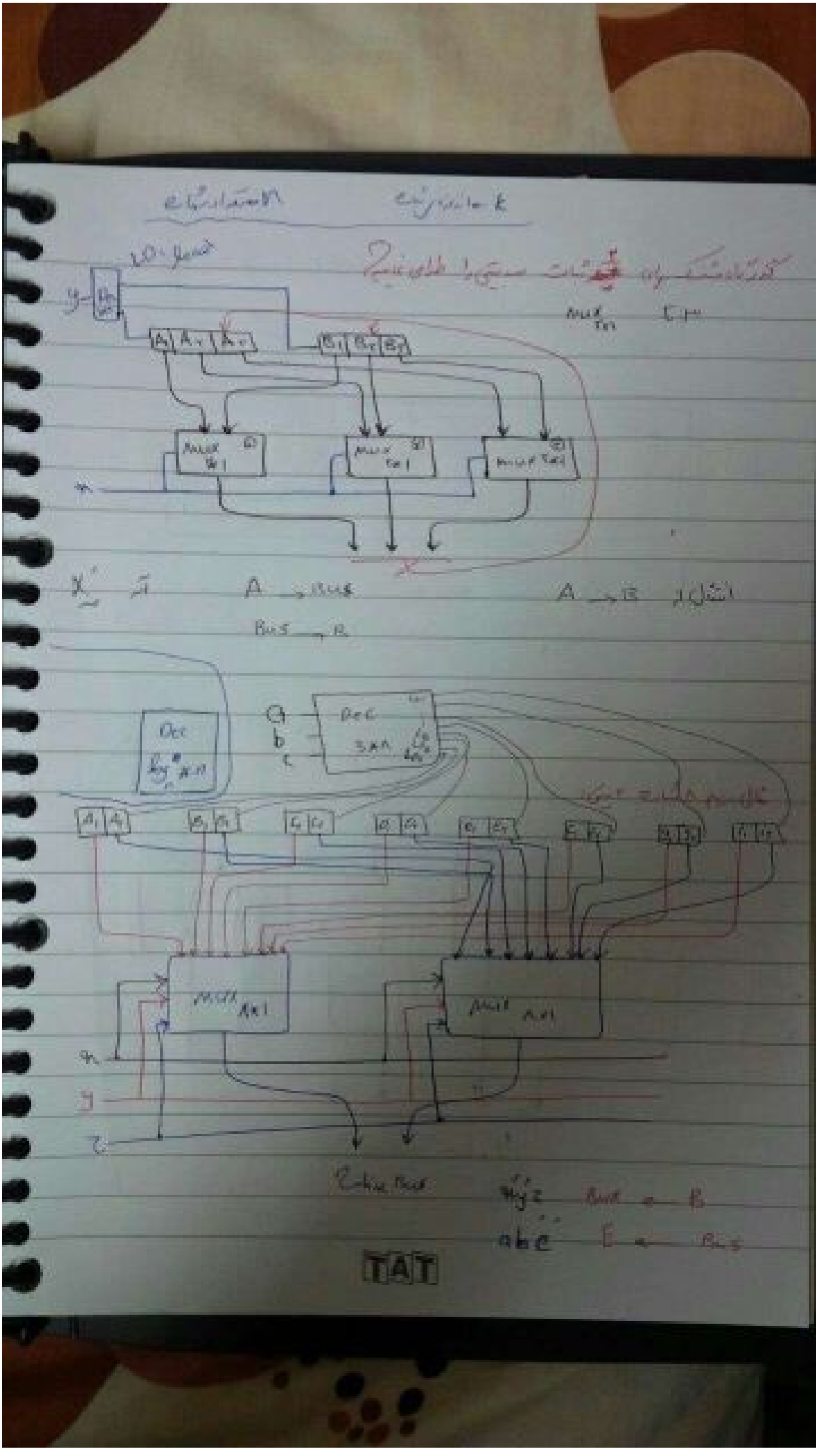
$P_6 = -60 \times (2) = -120$

$P_5 = 60 \times 4 = +120$

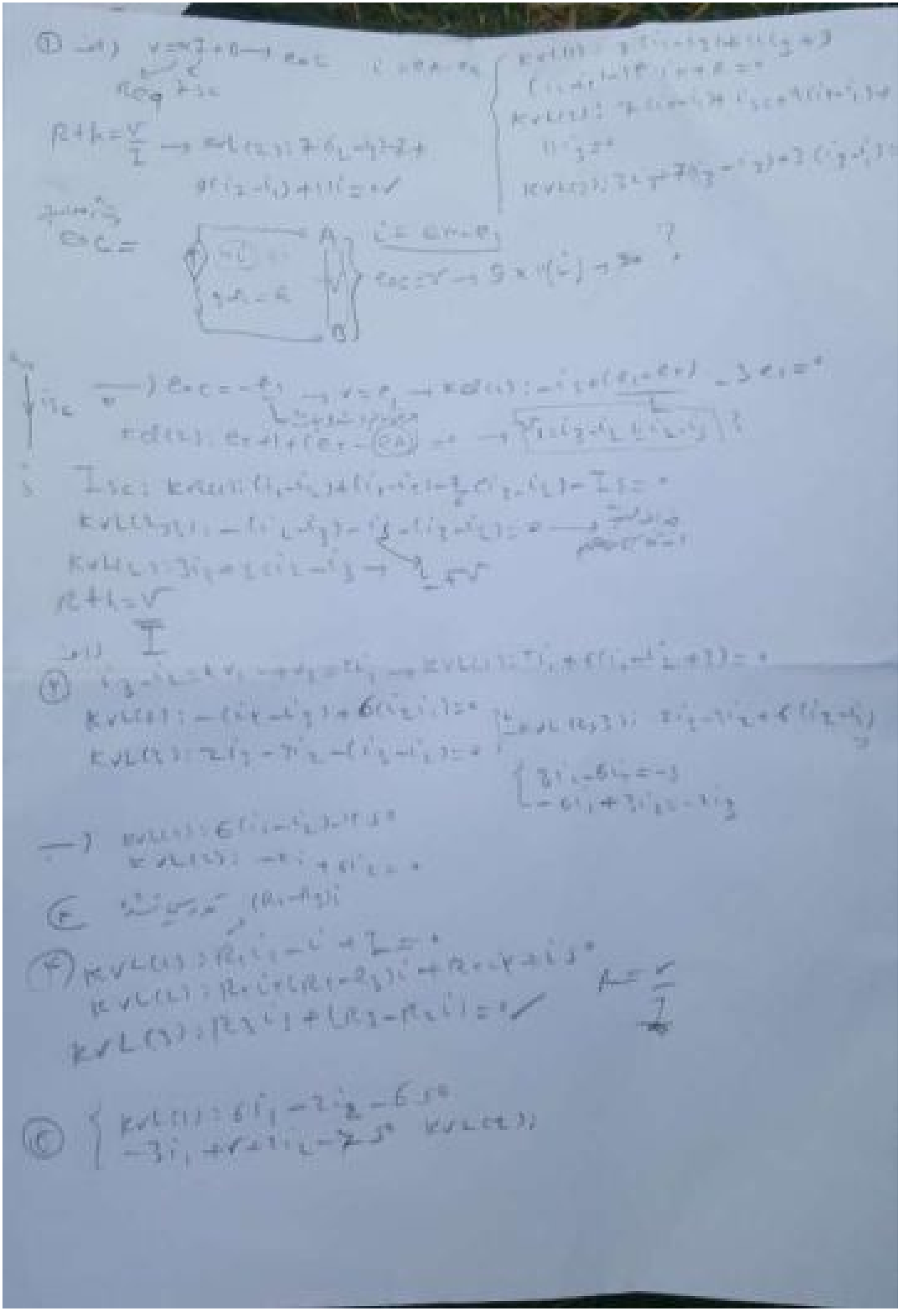
$P_5 + P_6 = 0$ مجموع جبری توان‌ها صفر

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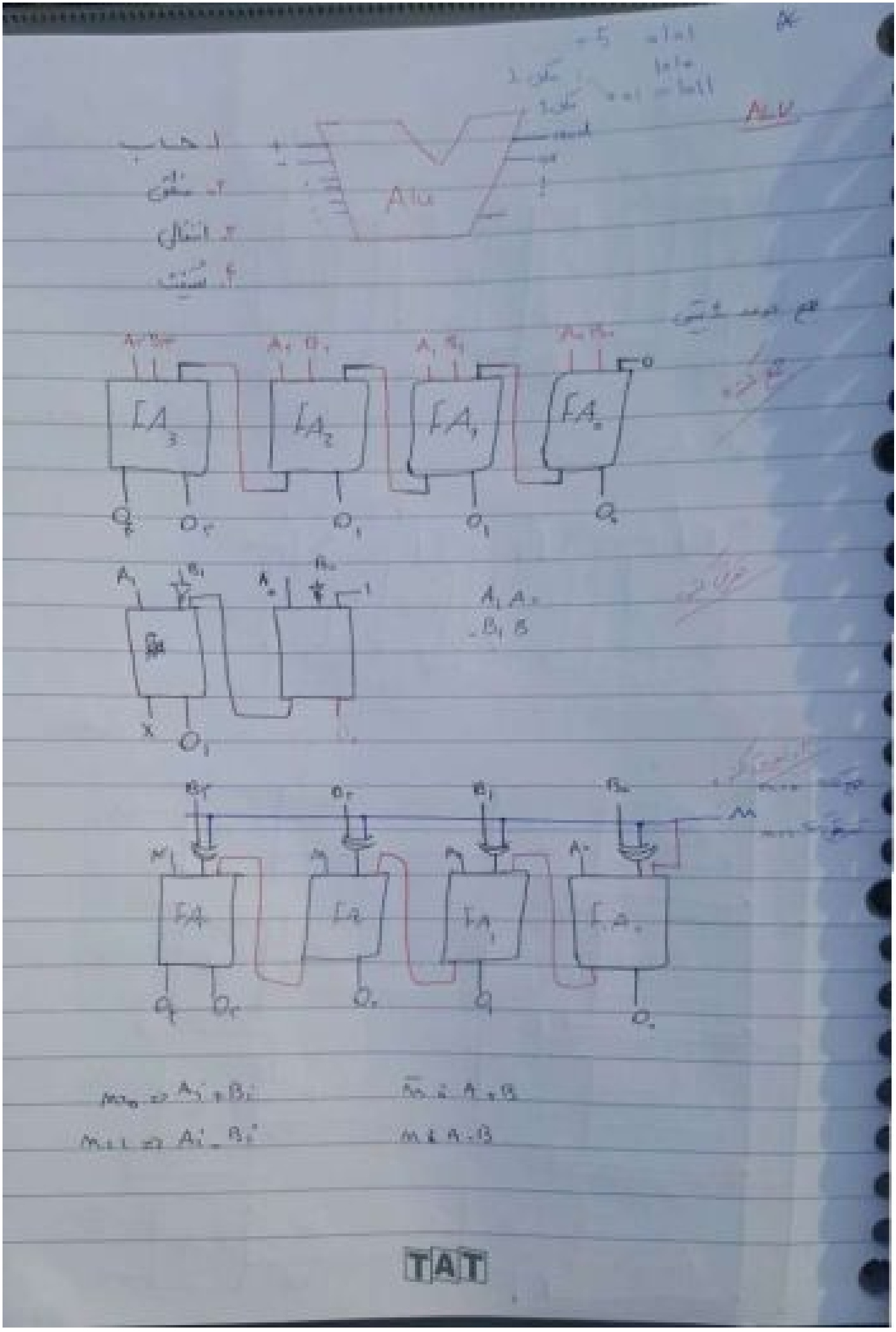

A
B
C
D
Ex1
MUX
4-line Bus



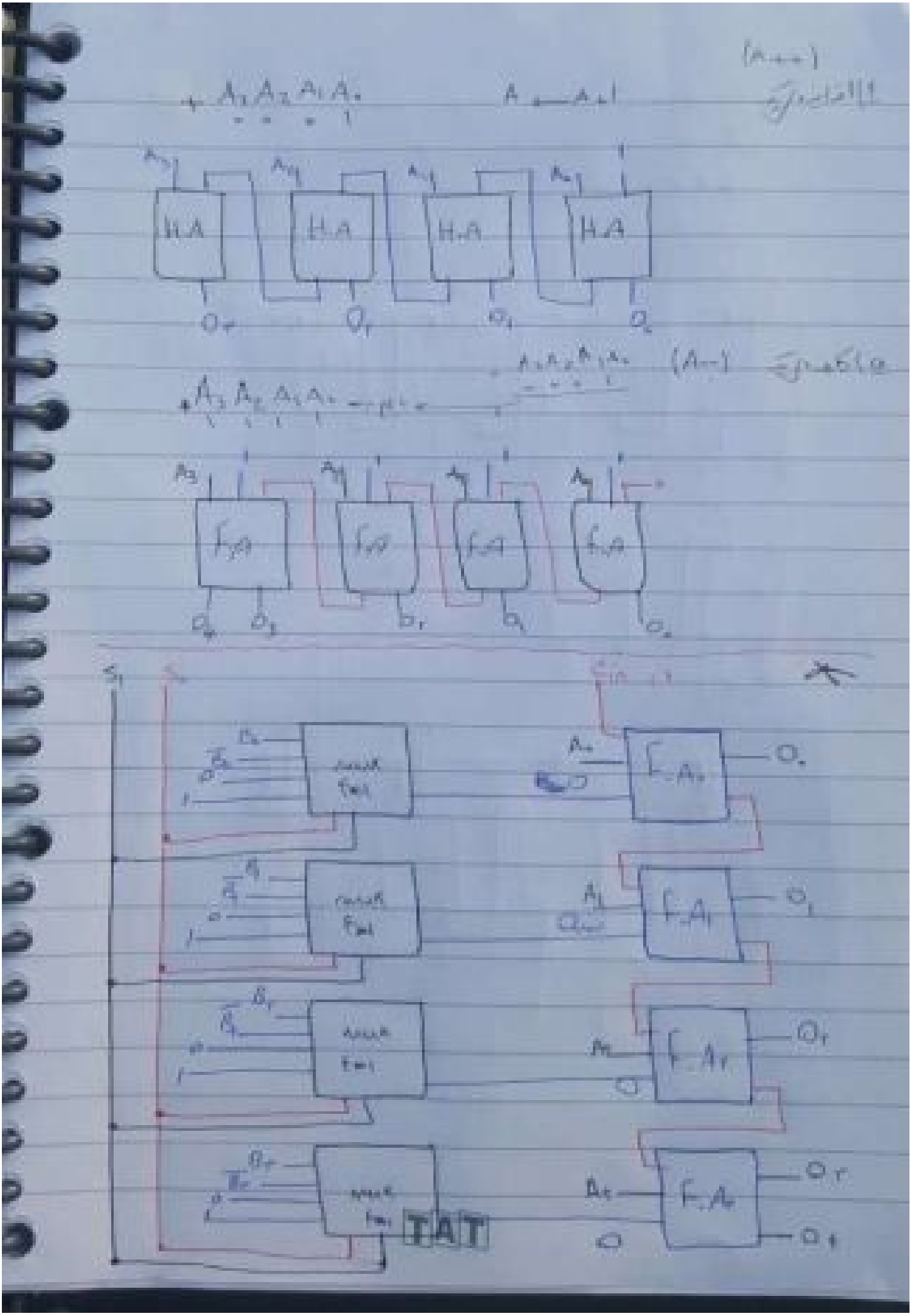
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Scanned by CamScanner



Scanned by CamScanner



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hassanimm

S_1	S_0	C_{in}	
0	0	0	$A+B$ جمع
0	0	1	$A+B+1$ جمع با نقلی
0	1	0	$A+\bar{B}$ تفریق با قرض
0	1	1	$A+\bar{B}+1 \Rightarrow A-B$ تفریق
1	0	0	A انتقال A
1	0	1	$A+1$ A افزایش
1	1	0	$A-1$ A کاهش
1	1	1	$A-1+1=A$ انتقال A

مدار یک

۲: عملیات شیفت:

* شیفت منطقی چپ
(یعنی ضرب در ۲)

* شیفت منطقی راست
(یعنی تقسیم بر ۲)

مثال

غلط

* شیفت حسابی:

شیفت چرخشی:



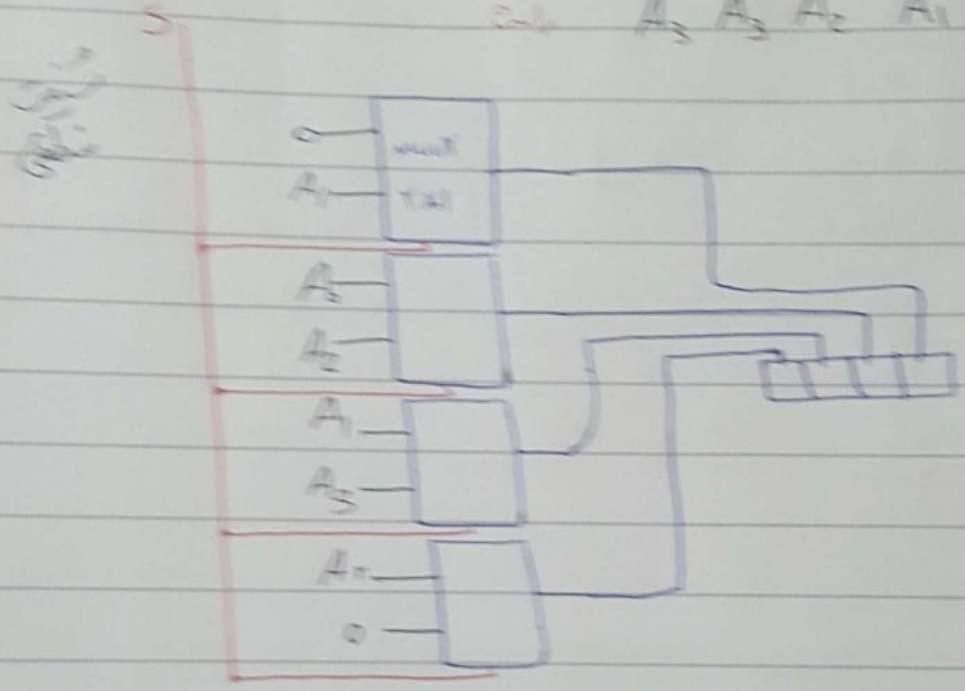
A_3 A_2 A_1 A_0

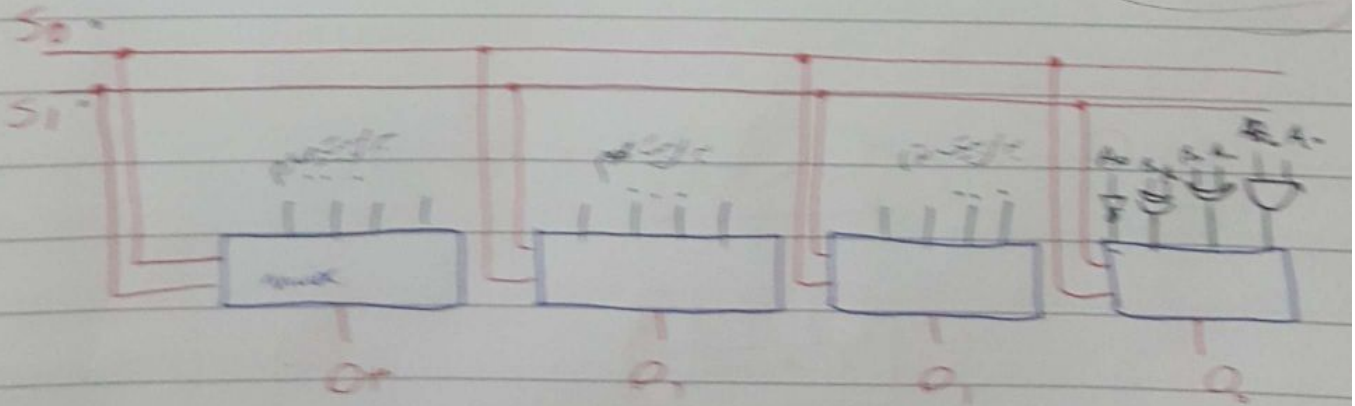
A_2 A_1 A_0 .

A_3 A_2 A_1

A_2 A_1 A_0 .

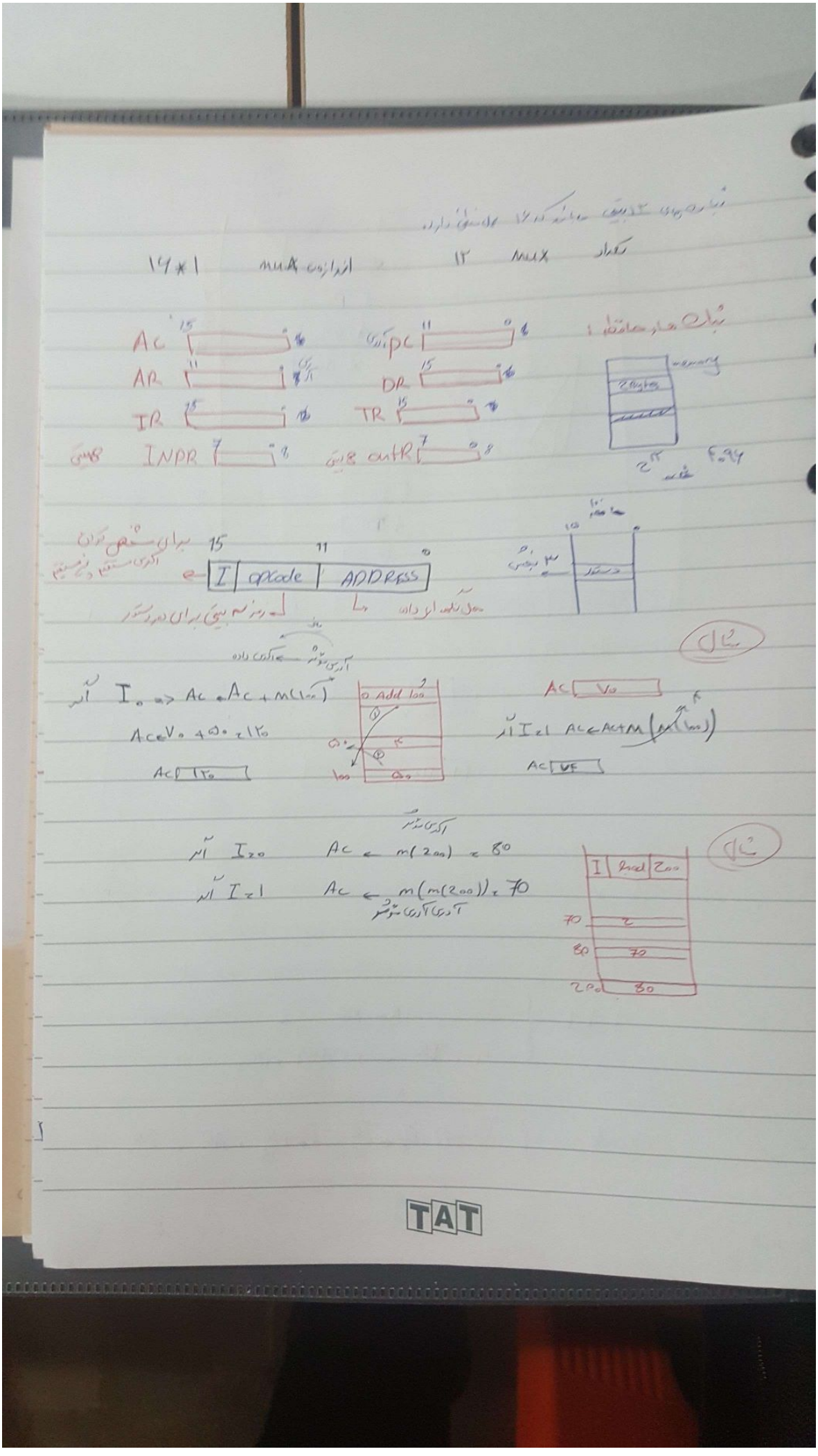
A_3 A_3 A_2 A_1

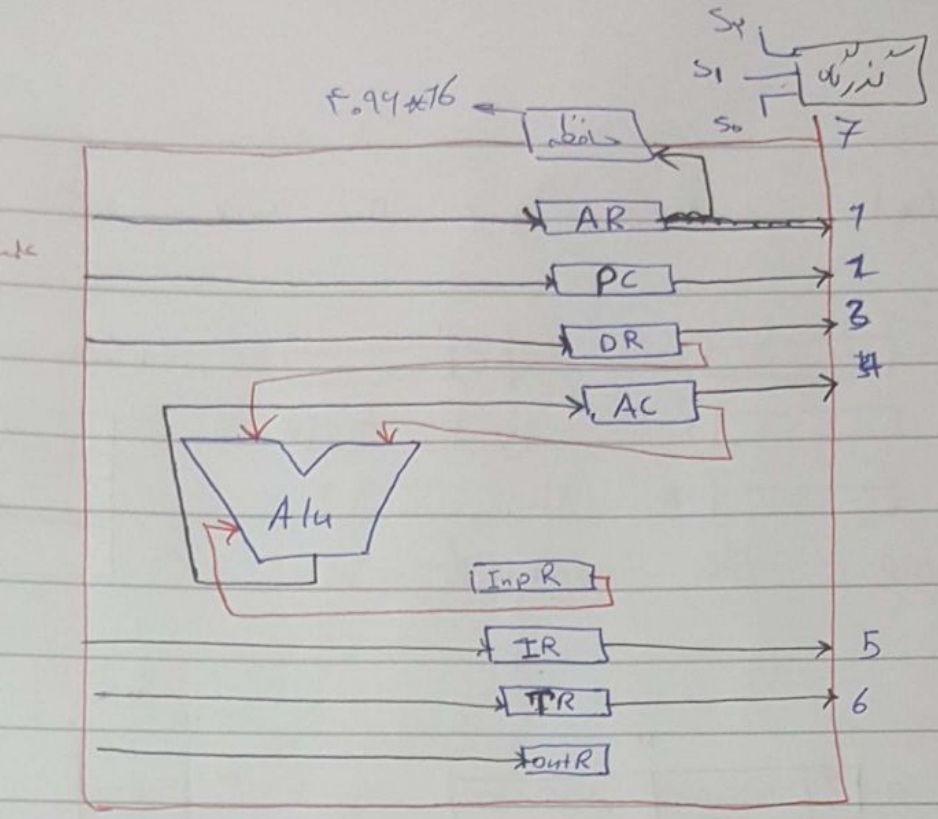




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AC, DR
عملیات ریاضی و منطقی

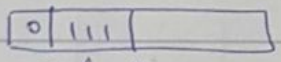
AC منبع خروجی

I	opcode	ADDRESS

۱- دستورات مراجعه به حافظه

opcode: $D_0 - D_7$

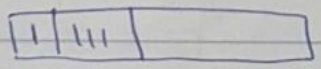
۲- دستورات مراجعه به ثبات



$I = 0$ opcode = 7

۳- دستورات ورودی و خروجی

opcode = 7 $I = 1$



مسیل اجرا دستورالعمل:

فاز یک: Fetch

فاز دو: Decode

فاز سه: execute

pc آدرس دستور دستورالعمل بعدی

IR بیت ۱۵ بیت اطلاعات به

Fetch { T_0 : $AR \leftarrow PC$
T_1 : $IR \leftarrow M[AR]$, $PC \leftarrow PC + 1$

Decode { T_2 : $D_0 - D_7 \leftarrow IR_{(12-14)}$, $I \leftarrow IR_{(15)}$, $AR \leftarrow IR_{(0-11)}$

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opcode / آدرس

$D'_7 I\ T_3$: $AR \leftarrow M[AR]$

$D'_7 I'\ T_3$: ———

000 And D_0 — 100 BUN D_4

001 ADD D_1 — 101 BSA D_5

010 LDA D_2 — 110 ISZ D_6

011 STA D_3 — 111 ~~test~~

$Ac \leftarrow Ac \wedge DR$

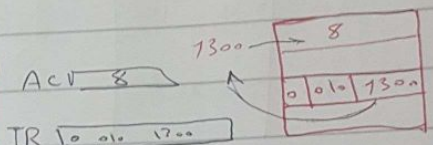
$D_0\ T_4$: $DR \leftarrow M[AR]$

$D_0\ T_5$: $Ac \leftarrow Ac \wedge DR$

$D_1\ T_4$: $DR \leftarrow M[AR]$

T_5: $Ac \leftarrow Ac + DR$

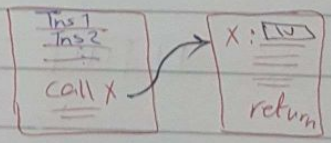
$D_3\ T_4$: $M[AR] \leftarrow Ac$



$D_2 T_4$: $DR \leftarrow M[AR]$

$D_2 T_5$: $Ac \leftarrow DR$

$D_4\ T_4$: $PC \leftarrow AR$



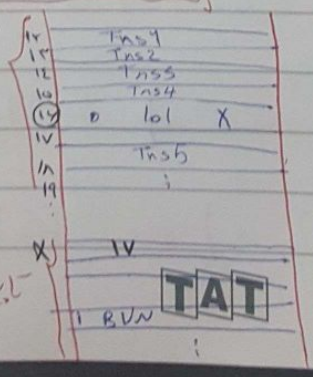
AR = X PC = 17

$D_5\ T_4$: $M[AR] \leftarrow PC$

return

M[X] = 17

$PC \leftarrow AR$



Call } Return

1V

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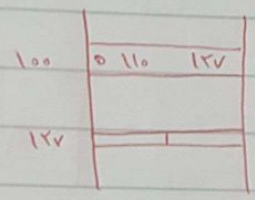
$D_5\ T_4$: $M[AR] \leftarrow pc$, $AR \leftarrow AR+1$

$D_5\ T_5$: $pc \leftarrow AR$

$D_6\ T_4$: $DR \leftarrow M[AR]$

$D_6\ T_5$: $DR \leftarrow DR+1$

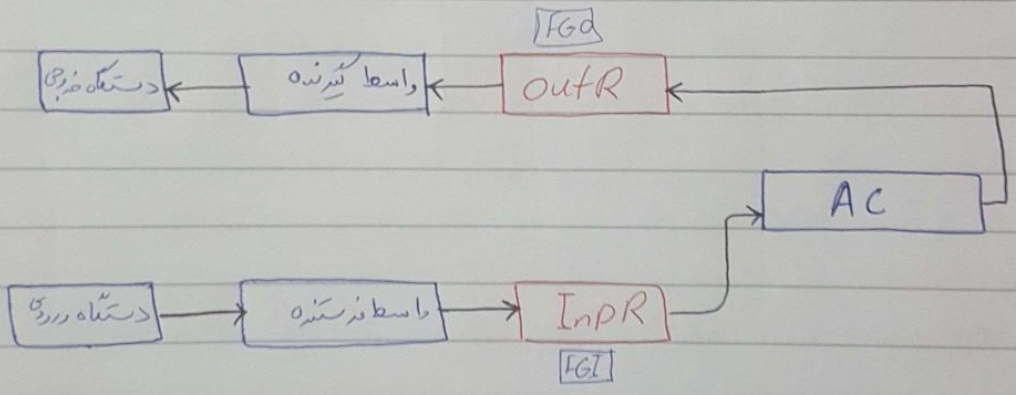
$D_6\ T_6$: $M[AR] \leftarrow DR$, IF $(DR = 0)$ then $pc \leftarrow pc+1$

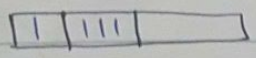


$AR = 127$ آدرس $\quad pc = 101 \quad DR = 1$

IF $DR = 0$ آدرس $\quad pc = 102$

IF $DR \neq 0$ آدرس $\quad pc = 101$





دستگاه ورودی وضعیتی عملیات ورودی عملیات ورودی FGI = 0 می‌گیرد

IF (InpR ← دستگاه ورودی) then FGI = 1

IF (AC ← InpR) then FGI = 0

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If (outR ← Ac) then FGO := 0 — علیاء

FGO := 1 — علیاء خروجی

If (← outR) then FGO := 1

X1	111	آدرس

بعد از ای ورودی و خروجی یک آپ کد میدیم که عملیات را کنترل می کند

Inp	1	111	000000000000
out	1	111	010000000000
skI	1	111	001000000000
skO	1	111	000100000000
ION	1	111	000010000000
IOf	1	111	000001000000

Inp — $AC_{0-7} \leftarrow InpR$, $FGI := 0$ — آزاد سازی ورودی بعدی

out — $outR \leftarrow AC_{0-7}$, $FGO := 0$ — توقف خروجی

skI — If (FGI = 1) then $PC \leftarrow PC+1$

skO — If (FGO = 1) then $PC \leftarrow PC+1$

ION — $IEN \leftarrow 1$ — روشن کردن فعال ساز وقفه

IOf — $IEN \leftarrow 0$ — خاموش کردن فعال ساز وقفه

T_0 : $AR \leftarrow PC$ — یادآوری

T_1 : $TR \leftarrow M[AR]$

T_2 : $I \leftarrow TR_{15}$, $D_{0-7} \leftarrow R_{12-15}$, $AR \leftarrow TR_{0-11}$

$p\ D_7 I' T_3$: $AC \leftarrow InpR$, $FGI := 0$ — Inp

بیت آدرس دهی

TAT

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