

MC542

Organização de Computadores

Aula 4

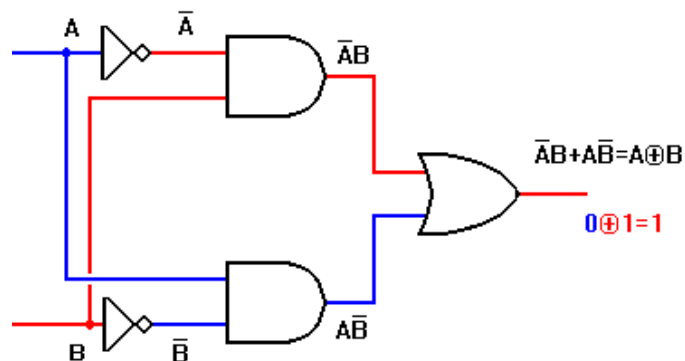
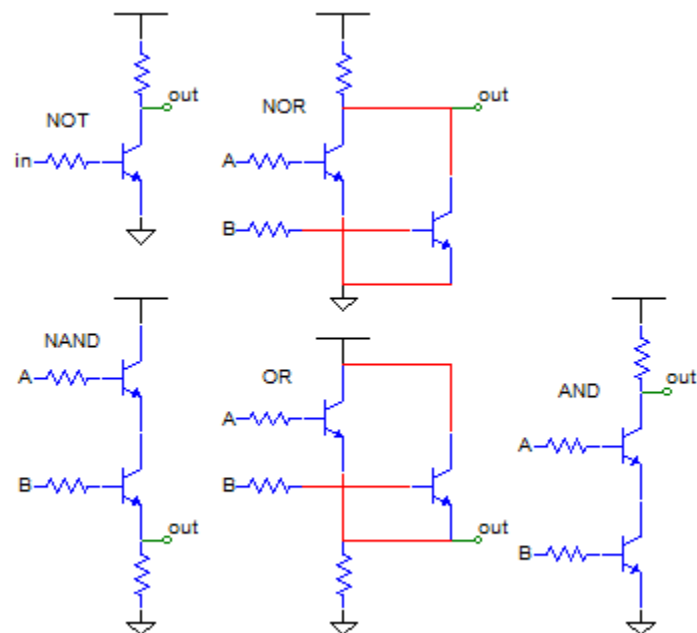
Somadores

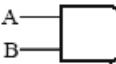
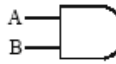
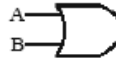
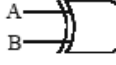
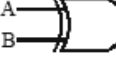
Professor: Rogério Drummond
PED: Bruno Bastos
Unicamp / 2012

Tópicos

- Revisão**
- SAP 1**
- Somadores**

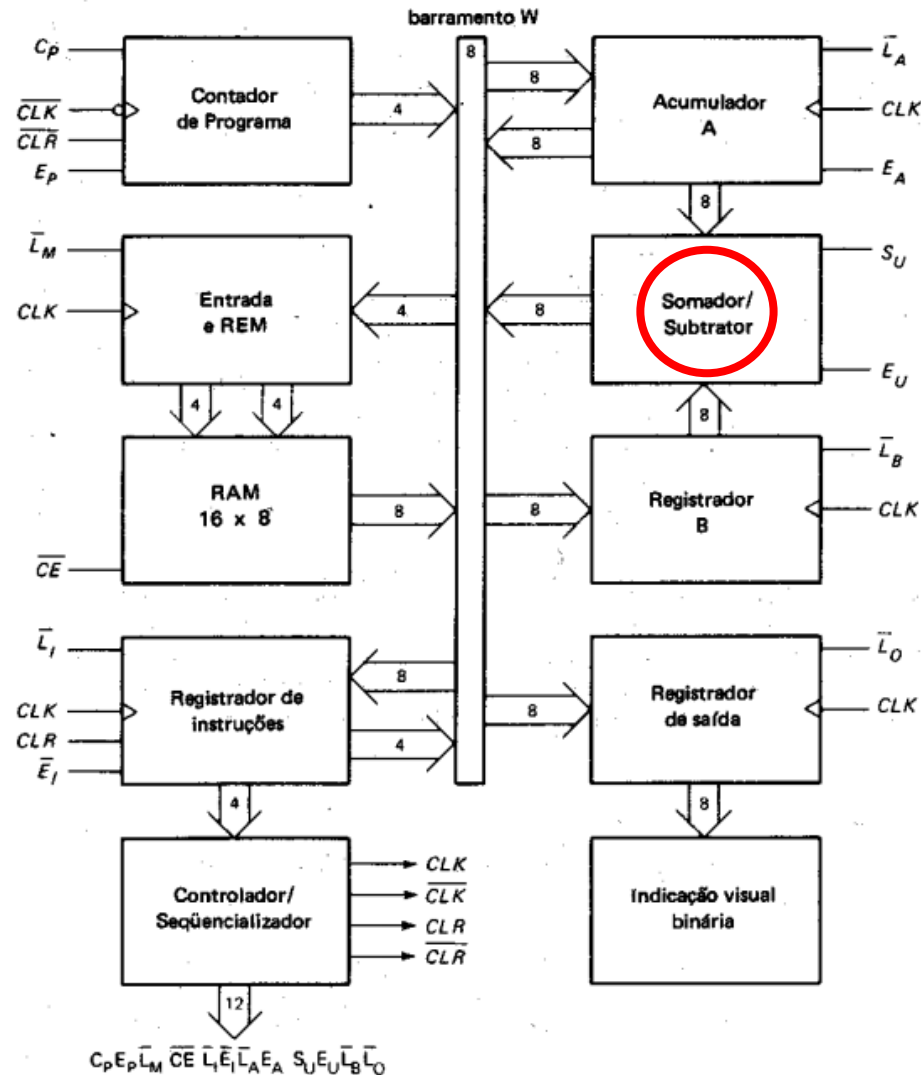
Revisão



BLOCOS LÓGICOS BÁSICOS																			
PORTA	Símbolo Usual	Tabela da Verdade	Função Lógica	Expressão															
E AND		<table><tr><th>A</th><th>B</th><th>S</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	A	B	S	0	0	0	0	1	0	1	0	0	1	1	1	Função E: Assume 1 quando todas as variáveis forem 1 e 0 nos outros casos.	$S=A.B$
A	B	S																	
0	0	0																	
0	1	0																	
1	0	0																	
1	1	1																	
OU OR		<table><tr><th>A</th><th>B</th><th>S</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	A	B	S	0	0	0	0	1	1	1	0	1	1	1	1	Função E: Assume 0 quando todas as variáveis forem 0 e 1 nos outros casos.	$S=A+B$
A	B	S																	
0	0	0																	
0	1	1																	
1	0	1																	
1	1	1																	
NÃO NOT		<table><tr><th>A</th><th>S</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td></tr></table>	A	S	0	1	1	0	Função NÃO: Inverte a variável aplicada à sua entrada.	$S=\overline{A}$									
A	S																		
0	1																		
1	0																		
NE NAND		<table><tr><th>A</th><th>B</th><th>S</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	S	0	0	1	0	1	1	1	0	1	1	1	0	Função NE: Inverso da função E.	$S=(\overline{A.B})$
A	B	S																	
0	0	1																	
0	1	1																	
1	0	1																	
1	1	0																	
NOU NOR		<table><tr><th>A</th><th>B</th><th>S</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	S	0	0	1	0	1	0	1	0	0	1	1	0	Função NOU: Inverso da função OU.	$S=(\overline{A+B})$
A	B	S																	
0	0	1																	
0	1	0																	
1	0	0																	
1	1	0																	
OU Exclusivo		<table><tr><th>A</th><th>B</th><th>S</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	S	0	0	0	0	1	1	1	0	1	1	1	0	Função OU Exclusivo: Assume 1 quando as variáveis assumirem valores diferentes entre si.	$S=A\oplus B$ $S=\overline{A}.B+A.\overline{B}$
A	B	S																	
0	0	0																	
0	1	1																	
1	0	1																	
1	1	0																	
Coincidência		<table><tr><th>A</th><th>B</th><th>S</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	A	B	S	0	0	1	0	1	0	1	0	0	1	1	1	Função Coincidência: Assume 1 quando houver coincidência entre os valores das variáveis.	$S=A\odot B$ $S=\overline{A}.\overline{B}+A.B$
A	B	S																	
0	0	1																	
0	1	0																	
1	0	0																	
1	1	1																	

SAP 1 - Simple As Possible

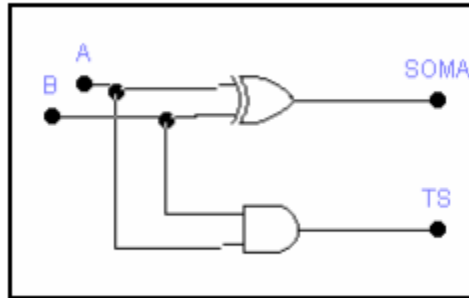
SAP-1



Somadores

Exercício

Determine a tabela verdade e a expressão do circuito abaixo:



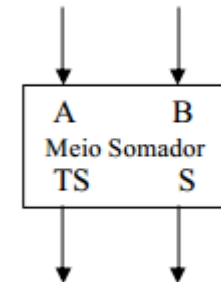
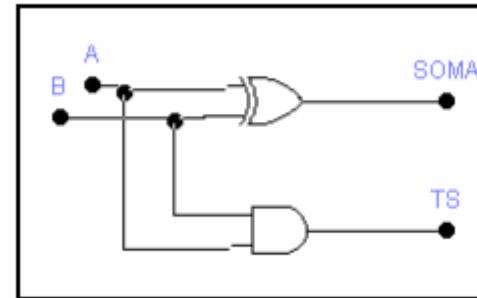
Meio Somador

A	B	SOMA	TS
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

TS – Transporte de Saída (vai um)

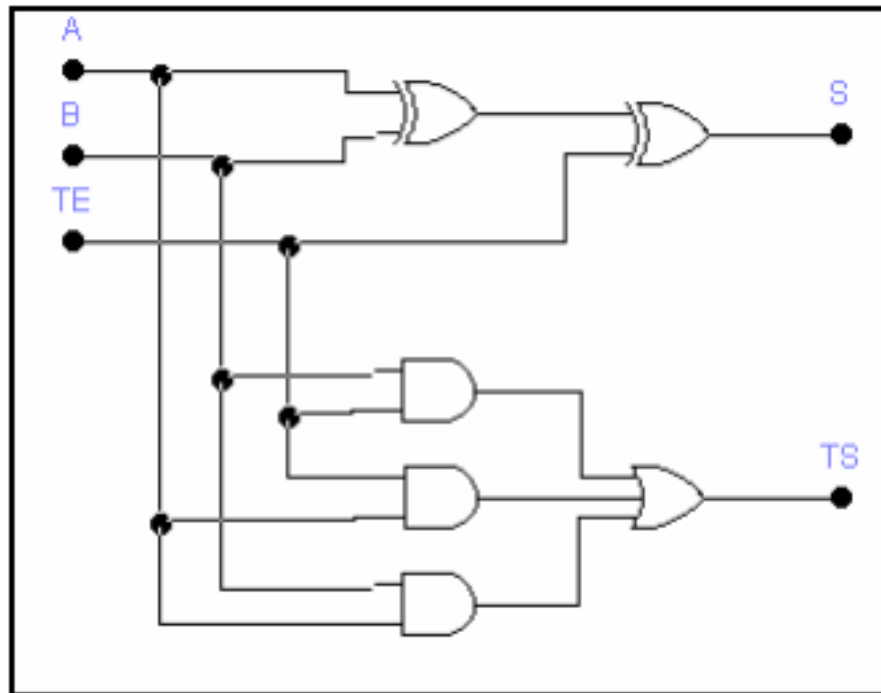
$$\text{SOMA} = A \oplus B$$

$$\text{TS} = A \cdot B$$



Exercício

Determine a tabela verdade e a expressão do circuito abaixo:



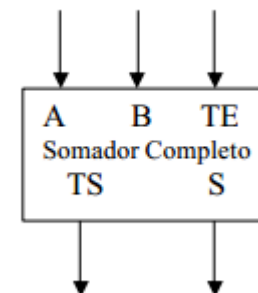
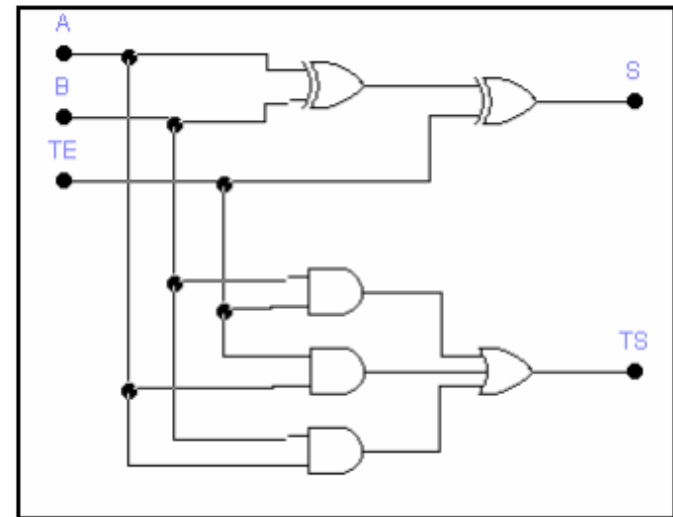
Somador Completo

Soma-se coluna a coluna, levando em conta o TE (Transporte de Entrada), que é o TS da coluna anterior. Dessa forma, o circuito efetua a soma completa de uma coluna, na forma: $S = (A+B)+TE$

A	B	TE	S	TS
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

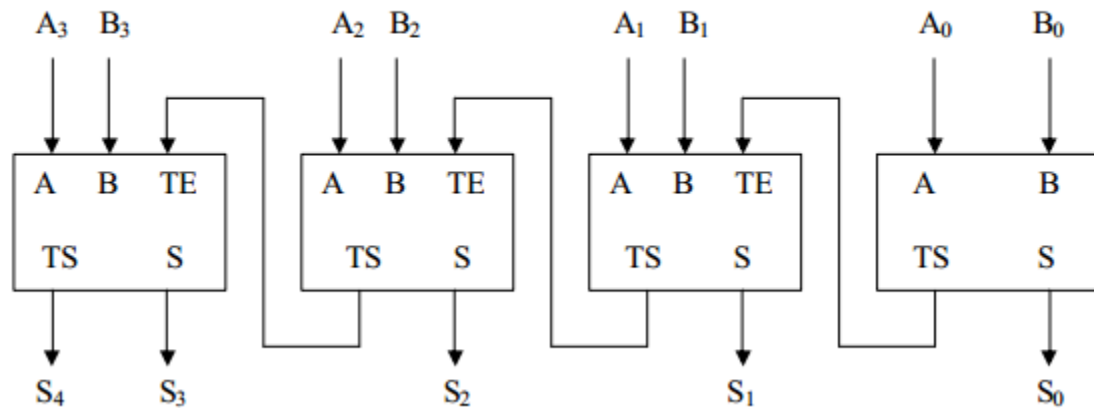
$$SOMA = A \oplus B \oplus TE$$

$$TS = A \cdot TE + B \cdot TE + A \cdot B$$



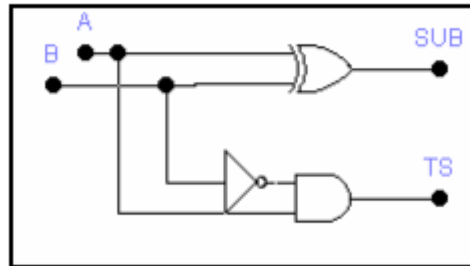
Somador Completo de 4 bits

Diagrama em blocos de um Somador de 2 números binários de 4 bits



Exercício

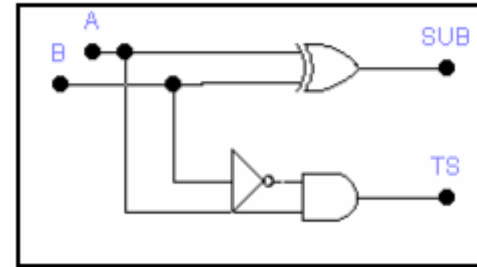
Determine a tabela verdade e a expressão do circuito abaixo:



Meio Subtrador

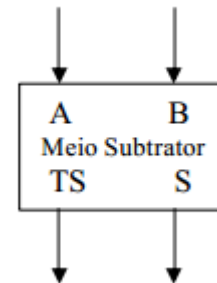
A	B	SUB	TS
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

TS – Transporte de Saída (empresta um)



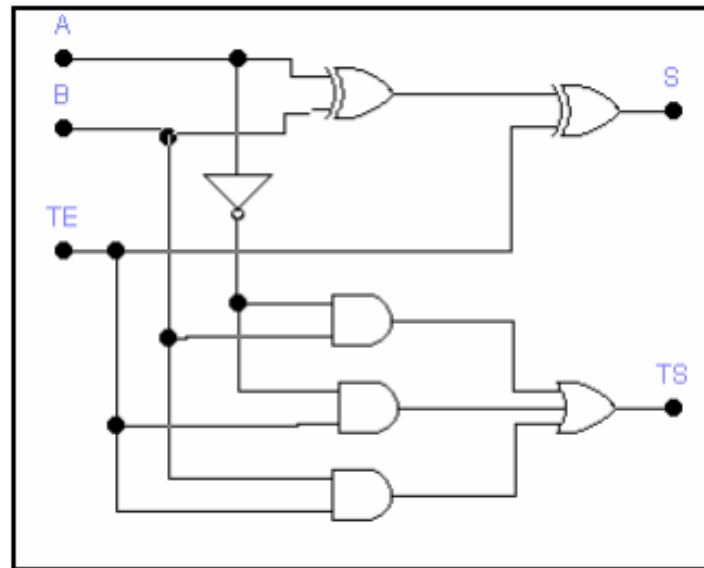
$$\text{SOMA} = A \oplus B$$

$$\text{TS} = A \cdot \bar{B}$$



Exercício

Determine a tabela verdade e a expressão do circuito abaixo:



Subtrator Completo

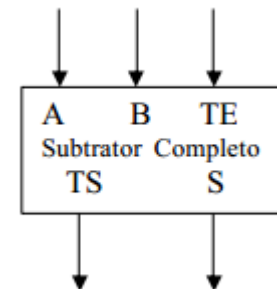
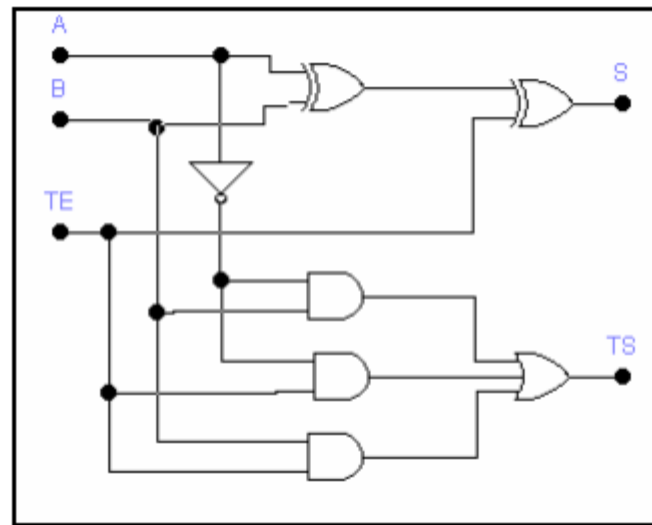
Subtrai-se coluna a coluna, levando em conta o TE (Transporte de Entrada), que é o TS da coluna anterior. Dessa forma, o circuito efetua a subtração completa de uma coluna, na forma:

$$S = (A-B) - TE$$

A	B	TE	S	TS
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

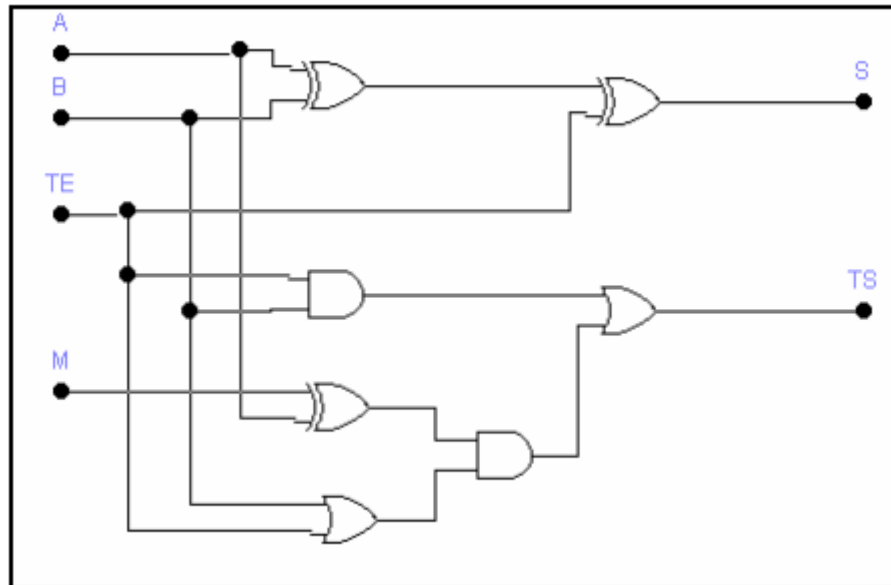
$$SOMA = A \oplus B \oplus TE$$

$$TS = \bar{A}.TE + B.TE + \bar{A}.B$$



Exercício

Determine a tabela verdade e a expressão do circuito abaixo:



Somador / Subtrador Binário

Para $M=0$ (Adição) $S = (A + B) + TE$

Para $M=1$ (Subtração) $S = (A - B) - TE$

M	A	B	TE	S	TS
0	0	0	0	0	0
0	0	0	1	1	0
0	0	1	0	1	0
0	0	1	1	0	1
0	1	0	0	1	0
0	1	0	1	0	1
0	1	1	0	0	1
0	1	1	1	1	1
1	0	0	0	0	0
1	0	0	1	1	1
1	0	1	0	1	1
1	0	1	1	0	1
1	1	0	0	1	0
1	1	0	1	0	0
1	1	1	0	0	0
1	1	1	1	1	1

$$SOMA = A \oplus B \oplus TE$$

$$TS = B \cdot TE + (M \oplus A) \cdot (B + TE)$$

