Arquitetura de Computadores

Turma LI21N/LT21N

AULA 11
Arquitectura de Von Neumann

TÓPICOS A ABORDAR

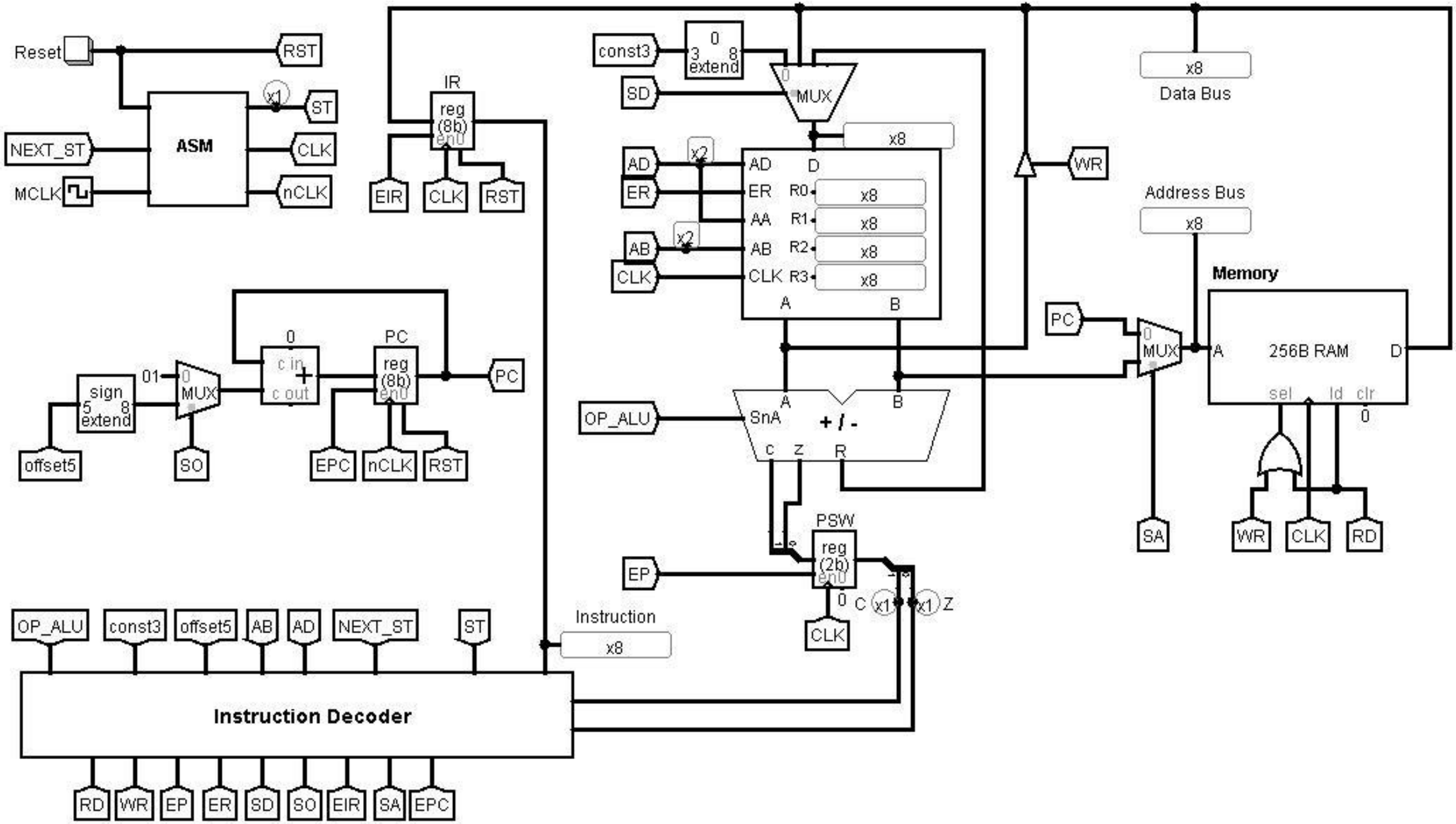
- *Características principais*
- *Diferenças relativas à arquitectura de Harvard*
- *Alterações à microarquitectura para implementação no modelo de Von Neumann*

Ano Lectivo 2019/2020

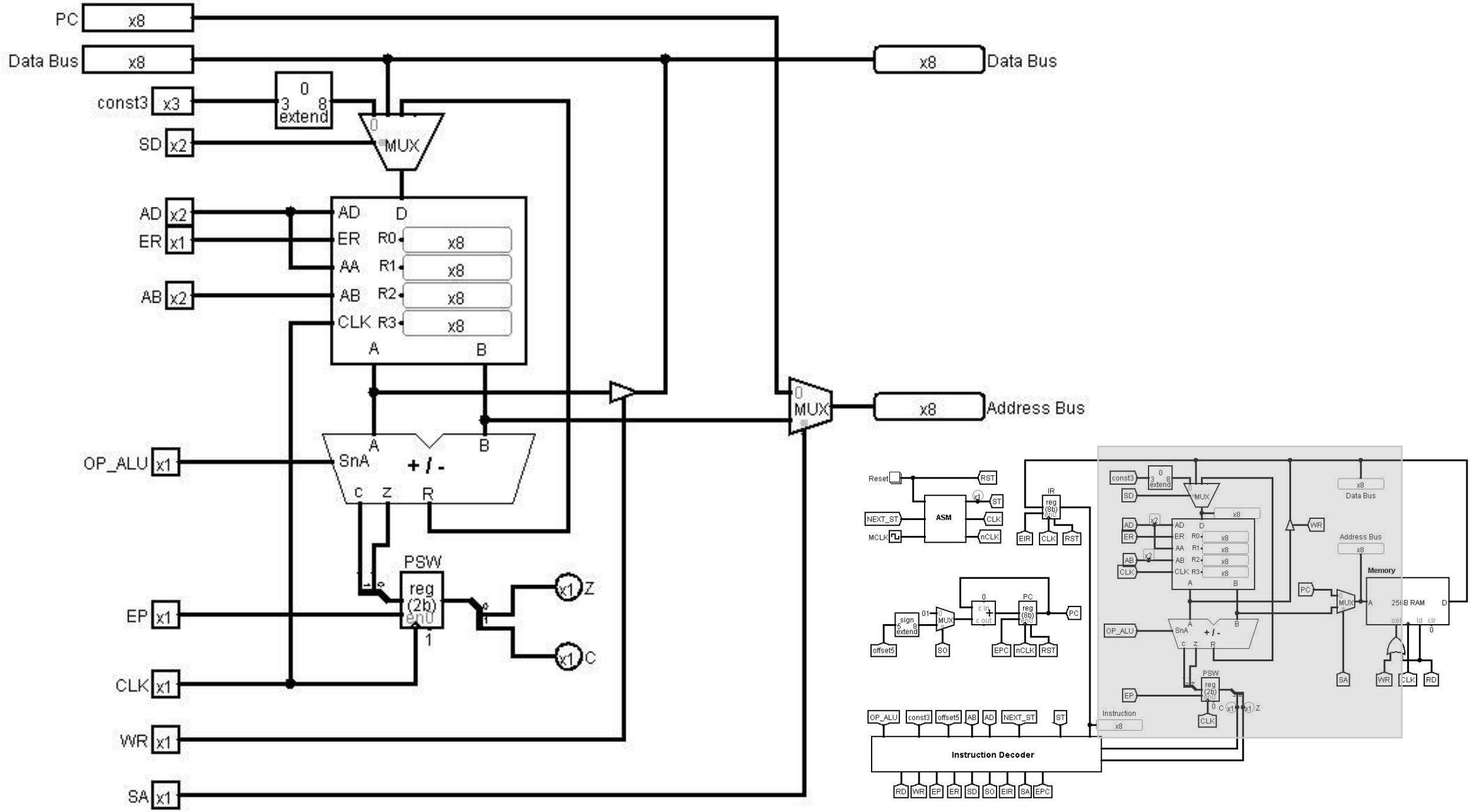
2º Semestre

Prof. Jorge Fonseca

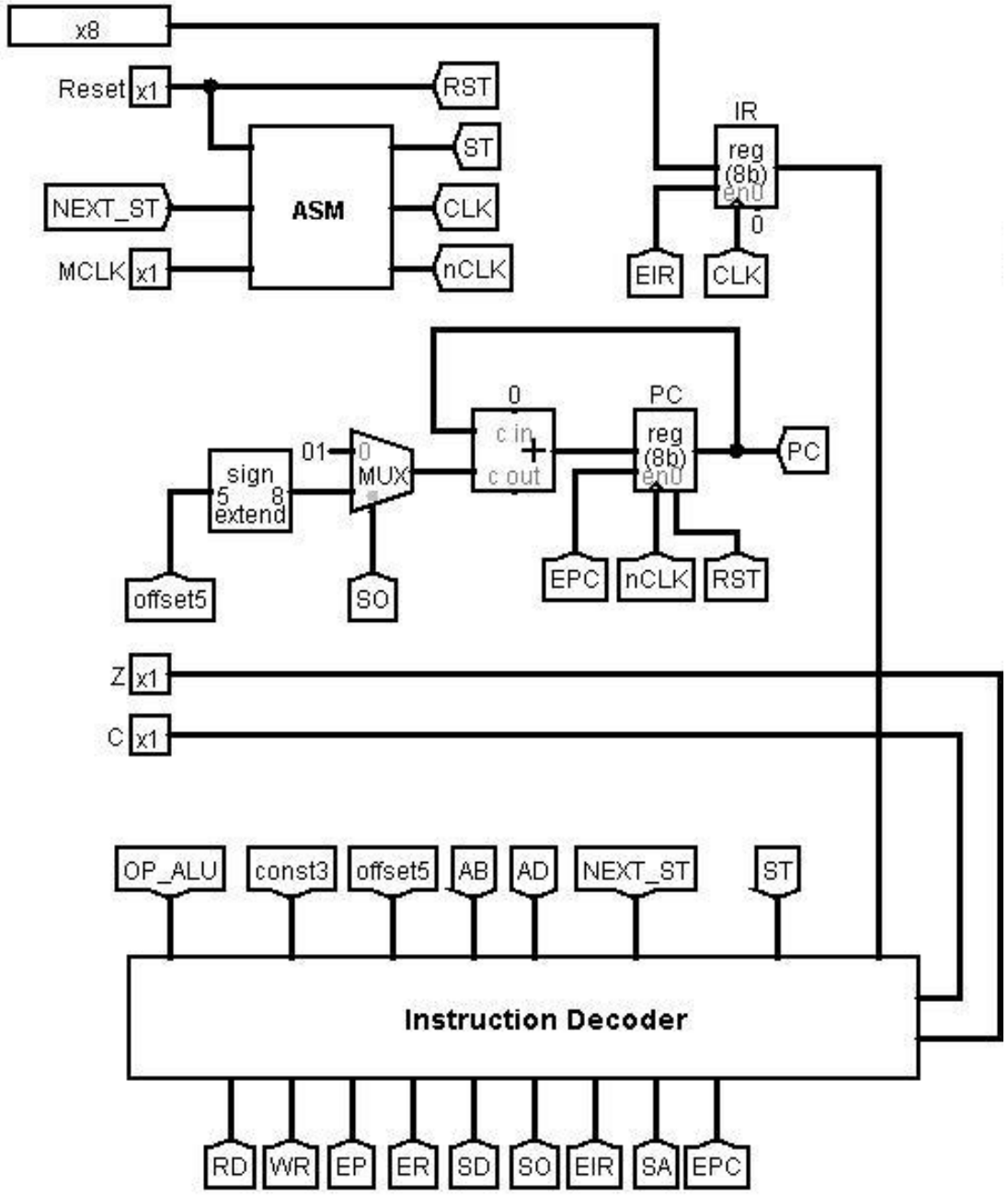
ARQUITECTURA DE VON NEUMANN

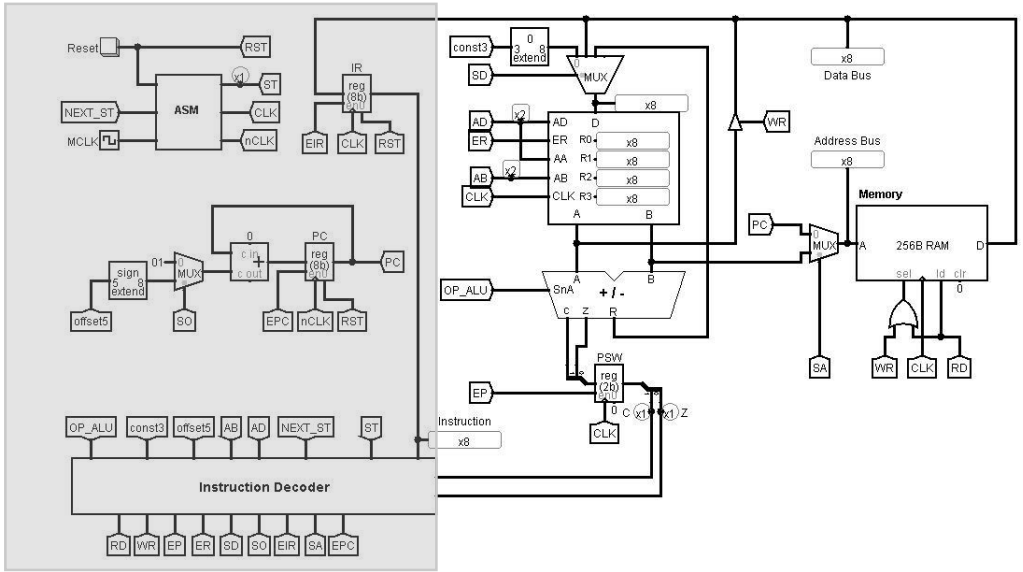


CPU – UNIDADE PROCESSAMENTO

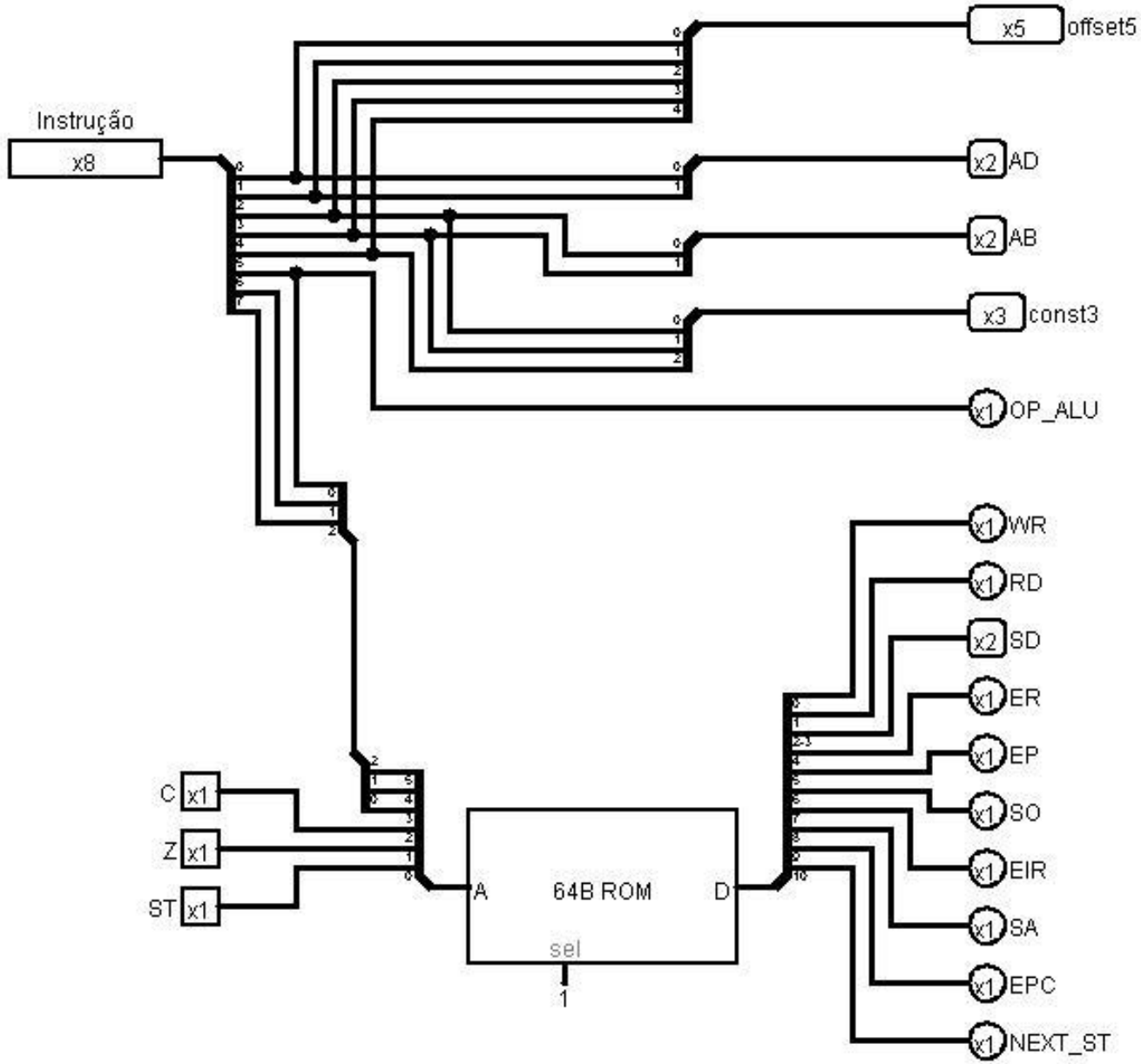


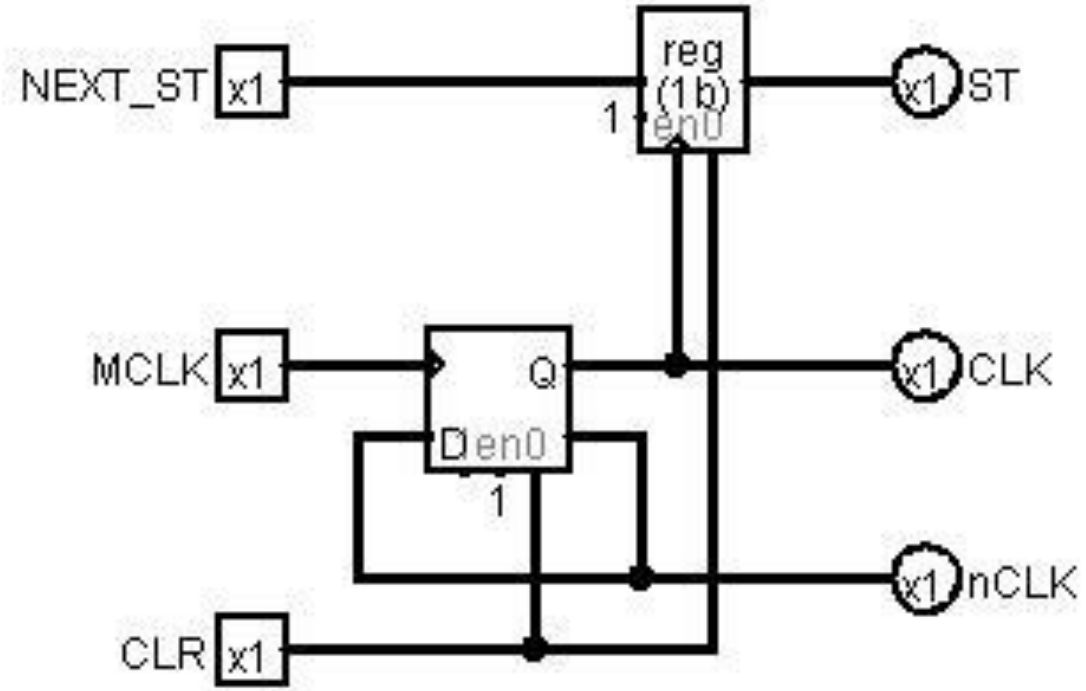
CPU – UNIDADE CONTROLO





INSTRUCTION DECODER




NEXT_ST
x1
reg
(1b)
1
en0
x1
ST
MCLK
x1
Q
D
en0
1
x1
CLK
x1
nCLK
CLR
x1

INSTRUCTION	OPCODE		OP_ALU		AB		AA/AD	
	7	*6*	*5*	*4*	*3*	*2*	*1*	*0*
ldi rx, const3	0	0	0	const3			rx	
ld rx, [ry]	0	0	1	-	ry		rx	
st rx, [ry]	0	1	1	-	rz		rx	
add rx, rz	1	0	0	-	rz		rx	
sub rx, rz	1	0	1	-	rz		rx	
bcc offset5	1	1	0	offset5				
bzs offset5	1	1	0	offset5				
b offset5	1	1	1	offset5				

INSTRUCTION DECODER

INSTRUCTION	OPCODE			C	Z	ST	NST	EPC	SA	EIR	SO	EP	ER	SD		RD	WR	HEX	PRG ROM	
	5	*4*	*3*	*2*	*1*	*0*	*10*	*9*	*8*	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*			
mov rx, const3	0	0	0	-	-	0	1	0	0	1	-	0	0	-	-	1	0	482	4*	FETCH
mov rx, const3	0	0	0	-	-	1	0	1	-	0	0	0	1	0	0	-	0	210		EXECUTE
ld rx, [ry]	0	0	1	-	-	0	1	0	0	1	-	0	0	-	-	1	0	482	4*	FETCH
ld rx, [ry]	0	0	1	-	-	1	0	1	1	0	0	0	1	0	1	1	0	316		EXECUTE
bcc offset5	0	1	0	0	-	0	1	0	0	1	-	0	0	-	-	1	0	482	2*	FETCH
bcc offset5	0	1	0	0	-	1	0	1	-	0	1	0	0	-	-	-	0	240		EXECUTE
bcc offset5	0	1	0	1	-	0	1	0	0	1	-	0	0	-	-	1	0	482	2*	FETCH
bcc offset5	0	1	0	1	-	1	0	1	-	0	0	0	0	-	-	-	0	200		EXECUTE
st rx, [ry]	0	1	1	-	-	0	1	0	0	1	-	0	0	-	-	1	0	482	4*	FETCH
st rx, [ry]	0	1	1	-	-	1	0	1	1	0	0	0	0	-	-	0	1	301		EXECUTE
add rx, ry	1	0	0	-	-	0	1	0	0	1	-	0	0	-	-	1	0	482	4*	FETCH
add rx, ry	1	0	0	-	-	1	0	1	-	0	0	1	1	1	0	-	0	238		EXECUTE
sub rx, ry	1	0	1	-	-	0	1	0	0	1	-	0	0	-	-	1	0	482	4*	FETCH
sub rx, ry	1	0	1	-	-	1	0	1	-	0	0	1	1	1	0	-	0	238		EXECUTE
bzs offset5	1	1	0	-	0	0	1	0	0	1	-	0	0	-	-	1	0	482	1*	FETCH
bzs offset5	1	1	0	-	0	1	0	1	-	0	0	0	0	-	-	-	0	200		EXECUTE
bzs offset5	1	1	0	-	1	0	1	0	0	1	-	0	0	-	-	1	0	482	1*	FETCH
bzs offset5	1	1	0	-	1	1	0	1	-	0	1	0	0	-	-	-	0	240		EXECUTE
bzs offset5	1	1	0	-	0	0	1	0	0	1	-	0	0	-	-	1	0	482	1*	FETCH
bzs offset5	1	1	0	-	0	1	0	1	-	0	0	0	0	-	-	-	0	200		EXECUTE
bzs offset5	1	1	0	-	1	0	1	0	0	1	-	0	0	-	-	1	0	482	1*	FETCH
bzs offset5	1	1	0	-	1	1	0	1	-	0	1	0	0	-	-	-	0	240		EXECUTE
b offset5	1	1	1	-	-	0	1	0	0	1	-	0	0	-	-	1	0	482	4*	FETCH
b offset5	1	1	1	-	-	1	0	1	-	0	1	0	0	-	-	-	0	240		EXECUTE

EXERCÍCIO

CORE5

	OPCODE				AB		AD/AA	
	7	6	5	4	3	2	1	0

Address	MNEMONICS			INSTRUCTION								
	LABEL	OPCODE	OPERANDS	BIN								HEX
00		B +9		1	1	1	0	1	0	0	1	E9
01		A		*Valor de A*								00
02		B		*Valor de B*								00
03		C		*Valor de C*								00
04		R		*Valor de R*								00
05												00
06												00
07												00
08												00
09	main:	MOV	R1,1	0	0	0	0	0	1	0	1	05
0A		LD	R0, [R1]	0	0	1	0	0	1	0	0	24
0B		MOV	R1,2	0	0	0	0	1	0	0	1	09
0C		LD	R1, [R1]	0	0	1	0	0	1	0	1	25
0D		ADD	R0, R1	1	0	0	0	0	1	0	0	84
0E		MOV	R1,3	0	0	0	0	1	1	0	1	0D
0F		LD	R1, [R1]	0	0	1	0	0	1	0	1	25
10		SUB	R0, R1	1	0	1	0	0	1	0	0	A4
11		MOV	R1,4	0	0	0	1	0	0	0	1	11
12		ST	R0, [R1]	0	1	1	0	0	1	0	0	64
13	L1:	B	L1	1	1	1	0	0	0	0	0	E0

Exercício1 : Escrever em Código Máquina um programa para determinar o A + B – C. Considere o operando A na posição de memória 1H, o operando B na posição de memória 2H e o operando C na posição de memória 3H. O resultado deve ser colocado na posição de memória 4H.