COMPUTER ARCHITECTURE

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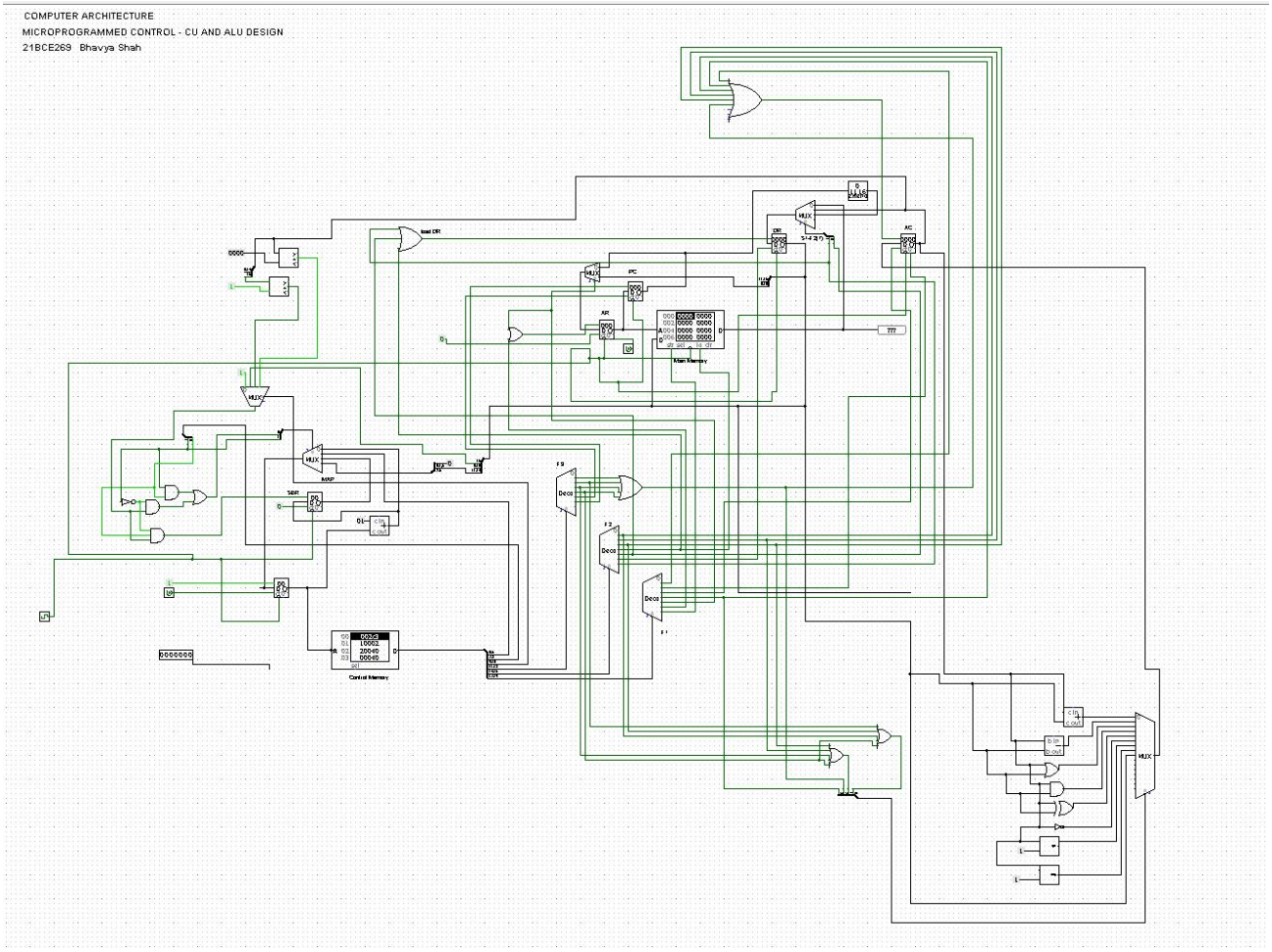
Project Definition: Control logic for all the registers in Microprogrammed Control (Design of Basic Computer for Microprogrammed Control)

To design micro programed control unit and arithmetic logic and shift unit in logisim

Components used:

- RAM
- ROM
- COUNTER
- SPLITER
- COMPARATOR
- MULTIPLEXER
- DECODER
- LOGICAL LEFT/RIGHT SHIFTER
- GATES



LOGIC TABLE:

CD table:

CD	Condition	Symbol
00	Always =1	U
01	DR(15)	I
10	AC(15)	S
11	AC=0	Z

BR table:

BR	Function	Symbol
00	CAR←AD if condition=1 CAR←CAR+1 if condition=0	JMP
01	CAR←AD, SBR←CAR if condition=1 CAR←CAR+1 if condition=0	CALL
10	CAR←SBR	RET
11	CAR(2-5)← DR(11-14) CAR(0,1,6)←0	MAP

Input logic truth table for Microprogram Sequencer:

BR field		Input			MUX1		Load SBR
		I_1	I_0	T	S_1	S_0	L
0	0	0	0	0	0	0	0
0	0	0	0	1	0	1	0
0	1	0	1	0	0	0	0
0	1	0	1	1	0	1	1
1	0	1	0	0	1	0	0
1	1	1	1	1	1	1	0

Logic table for ALU – design:

Operation	Selection lines			
	S_3	S_2	S_1	S_0
ADD	0	0	0	0
SUB	0	0	0	1
OR	0	0	1	0
AND	0	0	1	1
XOR	0	1	0	0
COMP	0	1	0	1
SHL	0	1	1	0
SHR	0	1	1	1
DRTAC	1	0	0	0

Symbolic Microprogram:

Label	**Microoperations**	**CD**	**BR**	**AD**
	ORG 0			
ADD:	NOP	I	CALL	INDRCT
	READ	U	JMP	NEXT
	ADD	U	JMP	FETCH
	ORG 4			
BRANCH:	NOP	S	JMP	OVER
	NOP	U	JMP	FETCH
OVER:	NOP	I	CALL	INDRCT
	ARTPC	U	JMP	FETCH
	ORG 8			
STORE:	NOP	I	CALL	INDRCT
	ACTDR	U	JMP	NEXT
	WRITE	U	JMP	FETCH

	ORG 12			
EXCHANGE:	NOP	I	CALL	INDRCT
	READ	U	JMP	NEXT
	ACTDR, DRTAC	U	JMP	NEXT
	WRITE	U	JMP	FETCH
	ORG 16			
AND :	NOP	I	CALL	INDRCT
	READ	U	JMP	NEXT
ANDOP :	AND	U	JMP	FETCH
	ORG 20			
SUB :	NOP	I	CALL	INDRCT
	READ	U	JMP	NEXT
	SUB	U	JMP	FETCH
	ORG 24			
ADM :	NOP	I	CALL	INDRCT
	READ	U	JMP	NEXT
	DRTAC, ACTDR	U	JMP	NEXT
	ADD	U	JMP	EXCHANGE +2
	ORG 28			
BTCL :	NOP	I	CALL	INDRCT
	READ	U	JMP	NEXT
	DRTAC, ACTDR	U	JMP	NEXT
	COM	U	JMP	ANDOP
	ORG 32			
BZ :	NOP	Z	JMP	ZERO
	NOP	U	JMP	FETCH
ZERO :	NOP	I	CALL	INDRCT
	ARTPC	U	JMP	FETCH
	ORG 36			
SEQ :	NOP	I	CALL	INDRCT
	READ	U	JMP	NEXT
	DRTAC, ACTDR	U	JMP	NEXT
	XOR (or SUB)	U	JMP	BEQ1
	ORG 69			
BEQ 1 :	DRTAC, ACTDR	Z	JMP	EQUAL
	NOP	U	JMP	FETCH
EQUAL :	INCPC	U	JPM	FETCH
	ORG 40			
BPNZ :	NOP	S	JMP	FETCH
	NOP	Z	JMP	FETCH

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                NOP             I       CALL    INDRCT
                ARTPC           U       JMP     FETCH
-------------------------------------------------------------------------------
                ORG 44
OR:             NOP             I       CALL    INDRCT
                READ            U       JMP     NEXT
                OR              U       JMP     FETCH
-------------------------------------------------------------------------------
                ORG 48
LOAD:           NOP             I       CALL    INDRCT
                READ            U       JMP     NEXT
                DRTAC           U       JMP     FETCH
-------------------------------------------------------------------------------
                ORG 52
SHIFT LEFT:     NOP             I       CALL    INDRCT
                READ            U       JMP     NEXT
                SHL             U       JMP     FETCH
-------------------------------------------------------------------------------
                ORG 56
SHIFT RIGHT:    NOP             I       CALL    INDRCT
                READ            U       JMP     NEXT
                SHR             U       JMP     FETCH
-------------------------------------------------------------------------------
                ORG 64
FETCH:          PCTAR           U       JMP     NEXT
                READ , INCPC    U       JMP     NEXT
                DRTAR           U       MAP
-------------------------------------------------------------------------------
                ORG 67
INDRCT:         READ            U       JMP     NEXT
                DRTAR           U       RET
-------------------------------------------------------------------------------
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INSTRUCTION IN MAIN MEMORY :

PROGRAM-1(ADD)

000- 6006(LDA)
001- 8007(ADD)
002- 1020(STORE)
006- 1111(OPERAND-1)
007- 0010(EFF. ADDRESS)
010- 0001(OPERAND-2)
020- RESULT TO BE STORED

PROGRAM-2

000-4020(BZ)
020- E040(LOAD I)
021- 0031(ADD)
022- 1032(STORE)
040- 0030(EA)
030- 1111(OPERAND-1)
031-0001(OPERAND-2)
032-RESULT

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