Registered Eight x Eight Signed Multiplier

Contents

1. Cover Sheet:

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CSE 4357/5357

Advanced Digital Logic Design

Spring Semester 2022

Assignment #4 – Registered Eight x Eight Signed Multiplier

Due Date – March 21, 2022 (11:59 PM)

Submit on Canvas Assignments

2. Design Requirements:

Eight bit Signed Multiplier should be Implemeted which should accept Multiplicand and Multiplier based on lnM and lnQ and a reset ccontrol signal to perform the multiplication as well as out signal to register output .

To implement this design,we require the below mentioned verilog modules and hardware .

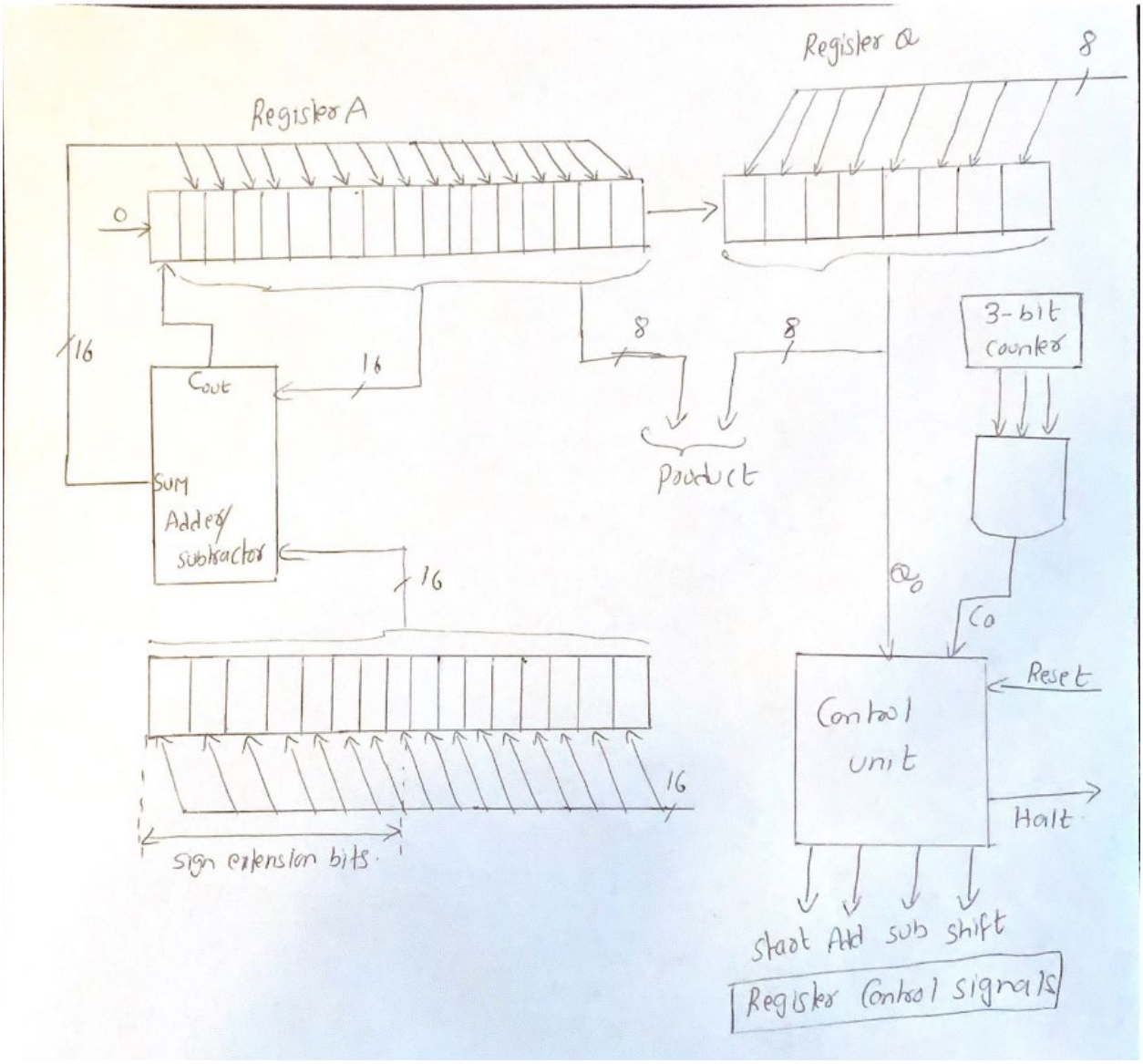
Verilog Modules:

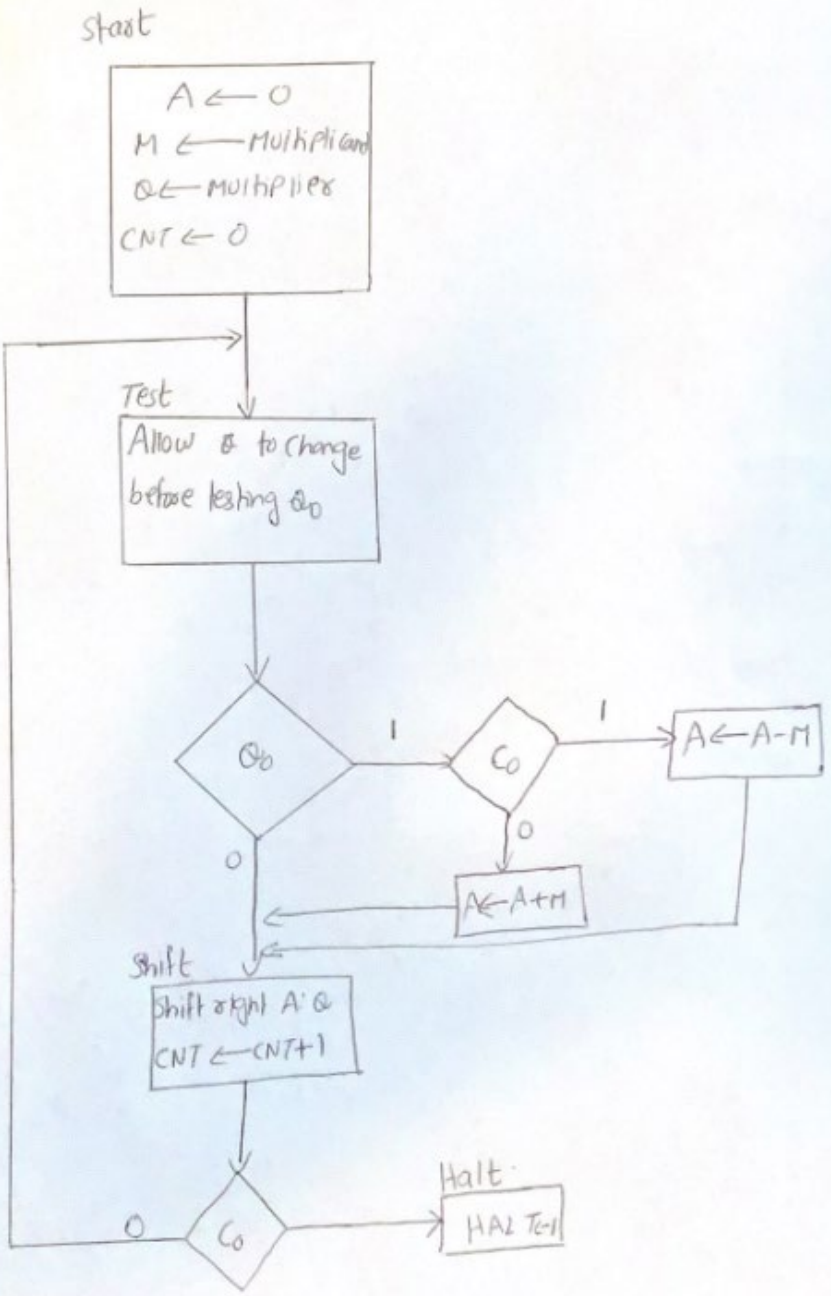
1. Eight_Bit_Multiplier
2. MultControl
3. Seven_segment_decoder_8_bit

Hardware:

1. Windows PC with Quartus Prime Lite edition
2. DE1-SoC board
3. JTAG CABLE
4. Power Supply

3. DATA PATH AND CONTROL PATH DIAGRAMS :





* For the last shift counter will move from "111" to "000". In the same clock cycle C_0 also will be tested for entering into Halt state. So there will be no issue.

4. Verilog Codes :

```
//Multiplier. Verilog behavioral model.
module Eight_Bit_Multiplier
	(
		input		Clock		,//clk_50MHz
		input		Reset		,//pushbutton 2
		input	[7:0]	A_B_data	,//switch[7:0]
		input		lnA		,//pushbutton 0
		input		lnB		,//pushbutton 1
		input		out		,//pushbutton 3
		output	[0:6]	Prod_nib_0	,//HEX0
		output	[0:6]	Prod_nib_1	,//HEX1
		output	[0:6]	Prod_nib_2	,//HEX2
		output	[0:6]	Prod_nib_3	,//HEX3
		output	[0:6]	multiplicand_multiplier_nib_0	,//HEX4
		output	[0:6]	multiplicand_multiplier_nib_1	//HEX5
	);

	reg	[7:0]	RegQ		;	// Q register
	reg	[16:0]	RegA		;	// A register
	reg	[16:0]	RegM		;	// M register
	reg	[2:0]	Count		;	//3-bit iteration counter
	reg	[15:0]	Product		;

	wire	C0, Start, Add, Shift, sub, sub_flag		;

	reg [7:0] Multiplicand ,Multiplier,input_disp_data		;

	always @(posedge Clock)
	begin
		if(lnA == 1'b0) begin
			Multiplicand		<=	A_B_data		;
			input_disp_data		<=	A_B_data		;
		end
		else if(lnB == 1'b0) begin
			Multiplier		<=	A_B_data		;
			input_disp_data		<=	A_B_data		;
		end
		else
		begin
			Multiplicand		<=	Multiplicand		;
			Multiplier		<=	Multiplier		;
			input_disp_data		<=	input_disp_data		;
		end
	end
```

```
always @(posedge Clock)
begin
	if(out == 1'b0 && Halt == 1'b1)
		Product <= {RegA[7:0],RegQ}				;
	else
		Product <= Product					;
end


// 3-bit counter for #iterations
always @(posedge Clock)
if (Start == 1)
	Count <= 3'b00				;	// clear in Start state
else if (Shift == 1)
	Count <= Count + 1			;	// increment in Shift state

assign C0 = Count[2] & Count[1] & Count[0]	;	// detect count = 7

// Multiplicand register (load only)
always @(posedge Clock)
	if (Start == 1)
		RegM <= {{8{Multiplicand[7]}},Multiplicand}	;

// Multiplier register (load, shift)
always @(posedge Clock)
if (Start == 1)
	RegQ <= Multiplier		;	// load in Start state
else if (Shift == 1)
	RegQ <= {RegA[0],RegQ[7:1]}	;	// shift in Shift state

// Accumulator register (clear, load, shift)
always @(posedge Clock)
if (Start == 1)
	RegA	<=	16'd0			;
else if(sub == 1)
	RegA	<=	RegA - RegM		;	//subtract sub stae
else if (Add == 1)
	RegA	<=	RegA + RegM		;	// load in Add state
else if(Shift == 1)				// shift in Shift state
	RegA	<=	RegA >> 1		;
```

```
	// Instantiate controller module

	MultControl Ctrl
	(
		.Clock(Clock)    ,
		.Reset(~Reset)  ,
		.Q0(RegQ[0])    ,
		.C0(C0)          ,
		.Start(Start)    ,
		.Add(Add)        ,
		.sub(sub)        ,
		.Shift(Shift)    ,
		.Halt(Halt)
	);

	Seven_segment_decoder_8_bit Prod_nib_0_nib1
(
	.input_data(Product[7:0]) ,	// input [7:0] input_data_sig
	.DISP_VAL0(Prod_nib_0) ,	// output [6:0] DISP_VAL0_sig
	.DISP_VAL1(Prod_nib_1)		// output [6:0] DISP_VAL1_sig
);

	Seven_segment_decoder_8_bit Prod_nib_2_nib3
(
	.input_data(Product[15:8]) ,	// input [7:0] input_data_sig
	.DISP_VAL0(Prod_nib_2) ,	// output [6:0] DISP_VAL0_sig
	.DISP_VAL1(Prod_nib_3)		// output [6:0] DISP_VAL1_sig
);


	Seven_segment_decoder_8_bit multiplicand_multiplier_nib_0_nib1
(
	.input_data(input_disp_data)		,	// input [7:0] input_data_sig
	.DISP_VAL0(multiplicand_multiplier_nib_0) ,	// output [6:0] DISP_VAL0_sig
	.DISP_VAL1(multiplicand_multiplier_nib_1)	// output [6:0] DISP_VAL1_sig
);

endmodule
```

```
//Multiplier controller. Verilog behavioral model.
module MultControl
	(
		input Clock, Reset, Q0, C0,
		output Start, Add,sub, Shift, Halt
	);

	reg [5:0] state;		//five states (one hot –one flip-flop per state)

	//one-hot state assignments for five states

	parameter StartS=6'b000001, TestS=6'b000010, AddS=6'b000100, ShiftS=6'b001000,
				HaltS=6'b010000,subS=6'b100000	;

	// State transitions on positive edge of Clock or Resets

	always @(posedge Clock, posedge Reset)
	if (Reset==1)
		state <= StartS			;		//enter StartS state on Reset
	else
	//change state on Clock
	case (state)
	StartS:
		state <= TestS			;		// StartS to TestS
	TestS:
		if (Q0 == 1 && C0 == 1)
			state <= subS		;		//TestS to subS
		else if(Q0 == 1)
			state <= AddS		;		// TestS to AddS if Q0=1
		else
			state <= ShiftS		;		// TestS to ShiftS if Q0=0
	AddS:
			state <= ShiftS		;		// AddS to ShiftS
	subS:
			state <= ShiftS		;		// subS to ShiftS
	ShiftS:
		if (C0)
			state <= HaltS		;		// ShiftS to HaltS if C0=1
		else
			state <= TestS		;		// ShiftS to TestS if C0=0
	HaltS:
			state <= HaltS		;		// stay in HaltS
	endcase
```

```
        // Moore model - activate one output per state
        assign Start    = state[0]      ;   // Start=1 in state StartS, else 0
        assign Add      = state[2]      ;   // Add=1 in state AddS, else 0
        assign Shift    = state[3]      ;   // Shift=1 in state ShiftS, else 0
        assign Halt     = state[4]      ;   // Halt=1 in state HaltS, else 0

        assign sub      = state[5]      ;

endmodule
```

```
module Seven_segment_decoder_8_bit
(
		input		[7:0]		input_data		,
		output reg [6:0]	DISP_VAL0		,
		output reg [6:0]	DISP_VAL1
);


		always @(input_data)
		case(input_data)
				8'h00: begin
						DISP_VAL0 = 7'b0000001; //00
						DISP_VAL1 = 7'b0000001;
					end
				8'h01: begin
						DISP_VAL0 = 7'b1001111; //01
						DISP_VAL1 = 7'b0000001;
					end
				8'h02: begin
						DISP_VAL0 = 7'b0010010; //02
						DISP_VAL1 = 7'b0000001;
					end
				8'h03: begin
						DISP_VAL0 = 7'b0000110; //03
						DISP_VAL1 = 7'b0000001;
					end
				8'h04: begin
						DISP_VAL0 = 7'b1001100; //04
						DISP_VAL1 = 7'b0000001;
					end
				8'h05: begin
						DISP_VAL0 = 7'b0100100; //05
						DISP_VAL1 = 7'b0000001;
					end
				8'h06: begin
						DISP_VAL0 = 7'b0100000; //06
						DISP_VAL1 = 7'b0000001;
					end
				8'h07: begin
						DISP_VAL0 = 7'b0001111; //07
						DISP_VAL1 = 7'b0000001;
					end
				8'h08: begin
						DISP_VAL0 = 7'b0000000; //08
						DISP_VAL1 = 7'b0000001;
					end
				8'h09: begin
						DISP_VAL0 = 7'b0001100; //09
						DISP_VAL1 = 7'b0000001;
					end
				8'h0A: begin
						DISP_VAL0 = 7'b0001000; //0A
						DISP_VAL1 = 7'b0000001;
					end
				8'h0B: begin
						DISP_VAL0 = 7'b1100000; //0B
						DISP_VAL1 = 7'b0000001;
					end
				8'h0C: begin
						DISP_VAL0 = 7'b0110001; //0C
						DISP_VAL1 = 7'b0000001;
					end
				8'h0D: begin
						DISP_VAL0 = 7'b1000010; //0D
						DISP_VAL1 = 7'b0000001;
					end
				8'h0E: begin
						DISP_VAL0 = 7'b0110000; //0E
						DISP_VAL1 = 7'b0000001;
					end
				8'h0F: begin
						DISP_VAL0 = 7'b0111000; //0F
						DISP_VAL1 = 7'b0000001;
					end

				8'h10: begin
						DISP_VAL0 = 7'b0000001; //10
						DISP_VAL1 = 7'b1001111;
					end
				8'h11: begin
						DISP_VAL0 = 7'b1001111; //11
						DISP_VAL1 = 7'b1001111;
					end
				8'h12: begin
						DISP_VAL0 = 7'b0010010; //12
						DISP_VAL1 = 7'b1001111;
					end
				8'h13: begin
						DISP_VAL0 = 7'b0000110; //13
						DISP_VAL1 = 7'b1001111;
					end
				8'h14: begin
						DISP_VAL0 = 7'b1001100; //14
						DISP_VAL1 = 7'b1001111;
					end
				8'h15: begin
						DISP_VAL0 = 7'b0100100; //15
						DISP_VAL1 = 7'b1001111;
					end
				8'h16: begin
						DISP_VAL0 = 7'b0100000; //16
						DISP_VAL1 = 7'b1001111;
					end
				8'h17: begin
						DISP_VAL0 = 7'b0001111; //17
						DISP_VAL1 = 7'b1001111;
```

```
                end
8'h18: begin
                        DISP_VAL0 = 7'b0000000; //18
                        DISP_VAL1 = 7'b1001111;
                end
8'h19: begin
                        DISP_VAL0 = 7'b0001100; //19
                        DISP_VAL1 = 7'b1001111;
                end
8'h1A: begin
                        DISP_VAL0 = 7'b0001000; //1A
                        DISP_VAL1 = 7'b1001111;
                end
8'h1B: begin
                        DISP_VAL0 = 7'b1100000; //1B
                        DISP_VAL1 = 7'b1001111;
                end
8'h1C: begin
                        DISP_VAL0 = 7'b0110001; //1C
                        DISP_VAL1 = 7'b1001111;
                end
8'h1D: begin
                        DISP_VAL0 = 7'b1000010; //1D
                        DISP_VAL1 = 7'b1001111;
                end
8'h1E: begin
                        DISP_VAL0 = 7'b0110000; //1E
                        DISP_VAL1 = 7'b1001111;
                end
8'h1F: begin
                        DISP_VAL0 = 7'b0111000; //1F
                        DISP_VAL1 = 7'b1001111;
                end

8'h20: begin
                        DISP_VAL0 = 7'b0000001; //20
                DISP_VAL1 = 7'b0010010;
                end
8'h21: begin
                        DISP_VAL0 = 7'b1001111; //21
                DISP_VAL1 = 7'b0010010;
                end
8'h22: begin
                        DISP_VAL0 = 7'b0010010; //22
                DISP_VAL1 = 7'b0010010;
                end
8'h23: begin
                        DISP_VAL0 = 7'b0000110; //23
                DISP_VAL1 = 7'b0010010;
                end
8'h24: begin
                        DISP_VAL0 = 7'b1001100; //24
                DISP_VAL1 = 7'b0010010;
                end
8'h25: begin
                        DISP_VAL0 = 7'b0100100; //25
                DISP_VAL1 = 7'b0010010;
                end
8'h26: begin
                        DISP_VAL0 = 7'b0100000; //26
                DISP_VAL1 = 7'b0010010;
                end
8'h27: begin
                        DISP_VAL0 = 7'b0001111; //27
                DISP_VAL1 = 7'b0010010;
                end
8'h28: begin
                        DISP_VAL0 = 7'b0000000; //28
                DISP_VAL1 = 7'b0010010;
                end
8'h29: begin
                        DISP_VAL0 = 7'b0001100; //29
                DISP_VAL1 = 7'b0010010;
                end
8'h2A: begin
                        DISP_VAL0 = 7'b0001000; //2A
                DISP_VAL1 = 7'b0010010;
                end
8'h2B: begin
                        DISP_VAL0 = 7'b1100000; //2B
                DISP_VAL1 = 7'b0010010;
                end
8'h2C: begin
                        DISP_VAL0 = 7'b0110001; //2C
                DISP_VAL1 = 7'b0010010;
                end
8'h2D: begin
                        DISP_VAL0 = 7'b1000010; //2D
                DISP_VAL1 = 7'b0010010;
                end
8'h2E: begin
                        DISP_VAL0 = 7'b0110000; //2E
                DISP_VAL1 = 7'b0010010;
                end
8'h2F: begin
                        DISP_VAL0 = 7'b0111000; //2F
                DISP_VAL1 = 7'b0010010;
                end

8'h30: begin
                        DISP_VAL0 = 7'b0000001; //30
                DISP_VAL1 = 7'b0000110;
                end
8'h31: begin
                        DISP_VAL0 = 7'b1001111; //31
                DISP_VAL1 = 7'b0000110;
```

```
                end
8'h32: begin
                        DISP_VAL0 = 7'b0010010; //32
                DISP_VAL1 = 7'b0000110;
                end
8'h33: begin
                        DISP_VAL0 = 7'b0000110; //33
                DISP_VAL1 = 7'b0000110;
                end
8'h34: begin
                        DISP_VAL0 = 7'b1001100; //34
                DISP_VAL1 = 7'b0000110;
                end
8'h35: begin
                        DISP_VAL0 = 7'b0100100; //35
                DISP_VAL1 = 7'b0000110;
                end
8'h36: begin
                        DISP_VAL0 = 7'b0100000; //36
                DISP_VAL1 = 7'b0000110;
                end
8'h37: begin
                        DISP_VAL0 = 7'b0001111; //37
                DISP_VAL1 = 7'b0000110;
                end
8'h38: begin
                        DISP_VAL0 = 7'b0000000; //38
                DISP_VAL1 = 7'b0000110;
                end
8'h39: begin
                        DISP_VAL0 = 7'b0001100; //39
                DISP_VAL1 = 7'b0000110;
                end
8'h3A: begin
                        DISP_VAL0 = 7'b0001000; //3A
                DISP_VAL1 = 7'b0000110;
                end
8'h3B: begin
                        DISP_VAL0 = 7'b1100000; //3B
                DISP_VAL1 = 7'b0000110;
                end
8'h3C: begin
                        DISP_VAL0 = 7'b0110001; //3C
                DISP_VAL1 = 7'b0000110;
                end
8'h3D: begin
                        DISP_VAL0 = 7'b1000010; //3D
                DISP_VAL1 = 7'b0000110;
                end
8'h3E: begin
                        DISP_VAL0 = 7'b0110000; //3E
                DISP_VAL1 = 7'b0000110;
                end
8'h3F: begin
                        DISP_VAL0 = 7'b0111000; //3F
                DISP_VAL1 = 7'b0000110;
                end

8'h40: begin
                        DISP_VAL0 = 7'b0000001; //40
                DISP_VAL1 = 7'b1001100;
                end
8'h41: begin
                        DISP_VAL0 = 7'b1001111; //41
                DISP_VAL1 = 7'b1001100;
                end
8'h42: begin
                        DISP_VAL0 = 7'b0010010; //42
                DISP_VAL1 = 7'b1001100;
                end
8'h43: begin
                        DISP_VAL0 = 7'b0000110; //43
                DISP_VAL1 = 7'b1001100;
                end
8'h44: begin
                        DISP_VAL0 = 7'b1001100; //44
                DISP_VAL1 = 7'b1001100;
                end
8'h45: begin
                        DISP_VAL0 = 7'b0100100; //45
                DISP_VAL1 = 7'b1001100;
                end
8'h46: begin
                        DISP_VAL0 = 7'b0100000; //46
                DISP_VAL1 = 7'b1001100;
                end
8'h47: begin
                        DISP_VAL0 = 7'b0001111; //47
                DISP_VAL1 = 7'b1001100;
                end
8'h48: begin
                        DISP_VAL0 = 7'b0000000; //48
                DISP_VAL1 = 7'b1001100;
                end
8'h49: begin
                        DISP_VAL0 = 7'b0001100; //49
                DISP_VAL1 = 7'b1001100;
                end
8'h4A: begin
                        DISP_VAL0 = 7'b0001000; //4A
                DISP_VAL1 = 7'b1001100;
                end
8'h4B: begin
                        DISP_VAL0 = 7'b1100000; //4B
                DISP_VAL1 = 7'b1001100;
                end
```

```
8'h4C: begin
                                DISP_VAL0 = 7'b0110001; //4C
                        DISP_VAL1 = 7'b1001100;
                        end
8'h4D: begin
                                DISP_VAL0 = 7'b1000010; //4D
                        DISP_VAL1 = 7'b1001100;
                        end
8'h4E: begin
                                DISP_VAL0 = 7'b0110000; //4E
                        DISP_VAL1 = 7'b1001100;
                        end
8'h4F: begin
                                DISP_VAL0 = 7'b0111000; //4F
                        DISP_VAL1 = 7'b1001100;
                        end

8'h50: begin
                                DISP_VAL0 = 7'b0000001; //50
                        DISP_VAL1 = 7'b0100100;
                        end
8'h51: begin
                                DISP_VAL0 = 7'b1001111; //51
                        DISP_VAL1 = 7'b0100100;
                        end
8'h52: begin
                                DISP_VAL0 = 7'b0010010; //52
                        DISP_VAL1 = 7'b0100100;
                        end
8'h53: begin
                                DISP_VAL0 = 7'b0000110; //53
                        DISP_VAL1 = 7'b0100100;
                        end
8'h54: begin
                                DISP_VAL0 = 7'b1001100; //54
                        DISP_VAL1 = 7'b0100100;
                        end
8'h55: begin
                                DISP_VAL0 = 7'b0100100; //55
                        DISP_VAL1 = 7'b0100100;
                        end
8'h56: begin
                                DISP_VAL0 = 7'b0100000; //56
                        DISP_VAL1 = 7'b0100100;
                        end
8'h57: begin
                                DISP_VAL0 = 7'b0001111; //57
                        DISP_VAL1 = 7'b0100100;
                        end
8'h58: begin
                                DISP_VAL0 = 7'b0000000; //58
                        DISP_VAL1 = 7'b0100100;
                        end
8'h59: begin
                                DISP_VAL0 = 7'b0001100; //59
                        DISP_VAL1 = 7'b0100100;
                        end
8'h5A: begin
                                DISP_VAL0 = 7'b0001000; //5A
                        DISP_VAL1 = 7'b0100100;
                        end
8'h5B: begin
                                DISP_VAL0 = 7'b1100000; //5B
                        DISP_VAL1 = 7'b0100100;
                        end
8'h5C: begin
                                DISP_VAL0 = 7'b0110001; //5C
                        DISP_VAL1 = 7'b0100100;
                        end
8'h5D: begin
                                DISP_VAL0 = 7'b1000010; //5D
                        DISP_VAL1 = 7'b0100100;
                        end
8'h5E: begin
                                DISP_VAL0 = 7'b0110000; //5E
                        DISP_VAL1 = 7'b0100100;
                        end
8'h5F: begin
                                DISP_VAL0 = 7'b0111000; //5F
                        DISP_VAL1 = 7'b0100100;
                        end

8'h60: begin
                                DISP_VAL0 = 7'b0000001; //60
                        DISP_VAL1 = 7'b0100000;
                        end
8'h61: begin
                                DISP_VAL0 = 7'b1001111; //61
                        DISP_VAL1 = 7'b0100000;
                        end
8'h62: begin
                                DISP_VAL0 = 7'b0010010; //62
                        DISP_VAL1 = 7'b0100000;
                        end
8'h63: begin
                                DISP_VAL0 = 7'b0000110; //63
                        DISP_VAL1 = 7'b0100000;
                        end
8'h64: begin
                                DISP_VAL0 = 7'b1001100; //64
                        DISP_VAL1 = 7'b0100000;
                        end
8'h65: begin
                                DISP_VAL0 = 7'b0100100; //65
                        DISP_VAL1 = 7'b0100000;
                        end
```

```
8'h66: begin
                                DISP_VAL0 = 7'b0100000; //66
                        DISP_VAL1 = 7'b0100000;
                        end
8'h67: begin
                                DISP_VAL0 = 7'b0001111; //67
                        DISP_VAL1 = 7'b0100000;
                        end
8'h68: begin
                                DISP_VAL0 = 7'b0000000; //68
                        DISP_VAL1 = 7'b0100000;
                        end
8'h69: begin
                                DISP_VAL0 = 7'b0001100; //69
                        DISP_VAL1 = 7'b0100000;
                        end
8'h6A: begin
                                DISP_VAL0 = 7'b0001000; //6A
                        DISP_VAL1 = 7'b0100000;
                        end
8'h6B: begin
                                DISP_VAL0 = 7'b1100000; //6B
                        DISP_VAL1 = 7'b0100000;
                        end
8'h6C: begin
                                DISP_VAL0 = 7'b0110001; //6C
                        DISP_VAL1 = 7'b0100000;
                        end
8'h6D: begin
                                DISP_VAL0 = 7'b1000010; //6D
                        DISP_VAL1 = 7'b0100000;
                        end
8'h6E: begin
                                DISP_VAL0 = 7'b0110000; //6E
                        DISP_VAL1 = 7'b0100000;
                        end
8'h6F: begin
                                DISP_VAL0 = 7'b0111000; //6F
                        DISP_VAL1 = 7'b0100000;
                        end

8'h70: begin
                                DISP_VAL0 = 7'b0000001; //70
                        DISP_VAL1 = 7'b0001111;
                        end
8'h71: begin
                                DISP_VAL0 = 7'b1001111; //71
                        DISP_VAL1 = 7'b0001111;
                        end
8'h72: begin
                                DISP_VAL0 = 7'b0010010; //72
                        DISP_VAL1 = 7'b0001111;
                        end
8'h73: begin
                                DISP_VAL0 = 7'b0000110; //73
                        DISP_VAL1 = 7'b0001111;
                        end
8'h74: begin
                                DISP_VAL0 = 7'b1001100; //74
                        DISP_VAL1 = 7'b0001111;
                        end
8'h75: begin
                                DISP_VAL0 = 7'b0100100; //75
                        DISP_VAL1 = 7'b0001111;
                        end
8'h76: begin
                                DISP_VAL0 = 7'b0100000; //76
                        DISP_VAL1 = 7'b0001111;
                        end
8'h77: begin
                                DISP_VAL0 = 7'b0001111; //77
                        DISP_VAL1 = 7'b0001111;
                        end
8'h78: begin
                                DISP_VAL0 = 7'b0000000; //78
                        DISP_VAL1 = 7'b0001111;
                        end
8'h79: begin
                                DISP_VAL0 = 7'b0001100; //79
                        DISP_VAL1 = 7'b0001111;
                        end
8'h7A: begin
                                DISP_VAL0 = 7'b0001000; //7A
                        DISP_VAL1 = 7'b0001111;
                        end
8'h7B: begin
                                DISP_VAL0 = 7'b1100000; //7B
                        DISP_VAL1 = 7'b0001111;
                        end
8'h7C: begin
                                DISP_VAL0 = 7'b0110001; //7C
                        DISP_VAL1 = 7'b0001111;
                        end
8'h7D: begin
                                DISP_VAL0 = 7'b1000010; //7D
                        DISP_VAL1 = 7'b0001111;
                        end
8'h7E: begin
                                DISP_VAL0 = 7'b0110000; //7E
                        DISP_VAL1 = 7'b0001111;
                        end
8'h7F: begin
                                DISP_VAL0 = 7'b0111000; //7F
                        DISP_VAL1 = 7'b0001111;
                        end
```

```
8'h80: begin
                                DISP_VAL0 = 7'b0000001; //80
                        DISP_VAL1       = 7'b0000000;
                        end

8'h81: begin
                                DISP_VAL0 = 7'b1001111; //81
                        DISP_VAL1       = 7'b0000000;
                        end
8'h82: begin
                                DISP_VAL0 = 7'b0010010; //82
                        DISP_VAL1       = 7'b0000000;
                        end

8'h83: begin
                                DISP_VAL0 = 7'b0000110; //83
                        DISP_VAL1       = 7'b0000000;
                        end

8'h84: begin
                                DISP_VAL0 = 7'b1001100; //84
                        DISP_VAL1       = 7'b0000000;
                        end

8'h85: begin
                                DISP_VAL0 = 7'b0100100; //85
                        DISP_VAL1       = 7'b0000000;
                        end
8'h86: begin
                                DISP_VAL0 = 7'b0100000; //86
                        DISP_VAL1       = 7'b0000000;
                        end

8'h87: begin
                                DISP_VAL0 = 7'b0001111; //87
                        DISP_VAL1       = 7'b0000000;
                        end

8'h88: begin
                                DISP_VAL0 = 7'b0000000; //88
                        DISP_VAL1       = 7'b0000000;
                        end

8'h89: begin
                                DISP_VAL0 = 7'b0001100; //89
                        DISP_VAL1       = 7'b0000000;
                        end
8'h8A: begin
                                DISP_VAL0 = 7'b0001000; //8A
                        DISP_VAL1       = 7'b0000000;
                        end

8'h8B: begin
                                DISP_VAL0 = 7'b1100000; //8B
                        DISP_VAL1       = 7'b0000000;
                        end

8'h8C: begin
                                DISP_VAL0 = 7'b0110001; //8C
                        DISP_VAL1       = 7'b0000000;
                        end

8'h8D: begin
                                DISP_VAL0 = 7'b1000010; //8D
                        DISP_VAL1       = 7'b0000000;
                        end
8'h8E: begin
                                DISP_VAL0 = 7'b0110000; //8E
                        DISP_VAL1       = 7'b0000000;
                        end

8'h8F: begin
                                DISP_VAL0 = 7'b0111000; //8F
                        DISP_VAL1       = 7'b0000000;
                        end


8'h90: begin
                                DISP_VAL0 = 7'b0000001; //90
                        DISP_VAL1       = 7'b0001100;
                        end

8'h91: begin
                                DISP_VAL0 = 7'b1001111; //91
                        DISP_VAL1       = 7'b0001100;
                        end
8'h92: begin
                                DISP_VAL0 = 7'b0010010; //92
                        DISP_VAL1       = 7'b0001100;
                        end

8'h93: begin
                                DISP_VAL0 = 7'b0000110; //93
                        DISP_VAL1       = 7'b0001100;
                        end

8'h94: begin
                                DISP_VAL0 = 7'b1001100; //94
                        DISP_VAL1       = 7'b0001100;
                        end

8'h95: begin
                                DISP_VAL0 = 7'b0100100; //95
                        DISP_VAL1       = 7'b0001100;
                        end
8'h96: begin
```

```
                                DISP_VAL0 = 7'b0100000; //96
                        DISP_VAL1       = 7'b0001100;
                        end

8'h97:  begin
                                DISP_VAL0 = 7'b0001111; //97
                        DISP_VAL1       = 7'b0001100;
                        end

8'h98:  begin
                                DISP_VAL0 = 7'b0000000; //98
                        DISP_VAL1       = 7'b0001100;
                        end

8'h99:  begin
                                DISP_VAL0 = 7'b0001100; //99
                        DISP_VAL1       = 7'b0001100;
                        end
8'h9A:  begin
                                DISP_VAL0 = 7'b0001000; //9A
                        DISP_VAL1       = 7'b0001100;
                        end

8'h9B:  begin
                                DISP_VAL0 = 7'b1100000; //9B
                        DISP_VAL1       = 7'b0001100;
                        end

8'h9C:  begin
                                DISP_VAL0 = 7'b0110001; //9C
                        DISP_VAL1       = 7'b0001100;
                        end

8'h9D:  begin
                                DISP_VAL0 = 7'b1000010; //9D
                        DISP_VAL1       = 7'b0001100;
                        end
8'h9E:  begin
                                DISP_VAL0 = 7'b0110000; //9E
                        DISP_VAL1       = 7'b0001100;
                        end

8'h9F:  begin
                                DISP_VAL0 = 7'b0111000; //9F
                        DISP_VAL1       = 7'b0001100;
                        end


8'hA0:  begin
                                DISP_VAL0 = 7'b0000001; //A0
                        DISP_VAL1       = 7'b0001000;
                        end

8'hA1:  begin
                                DISP_VAL0 = 7'b1001111; //A1
                        DISP_VAL1       = 7'b0001000;
                        end
8'hA2:  begin
                                DISP_VAL0 = 7'b0010010; //A2
                        DISP_VAL1       = 7'b0001000;
                        end

8'hA3:  begin
                                DISP_VAL0 = 7'b0000110; //A3
                        DISP_VAL1       = 7'b0001000;
                        end

8'hA4:  begin
                                DISP_VAL0 = 7'b1001100; //A4
                        DISP_VAL1       = 7'b0001000;
                        end

8'hA5:  begin
                                DISP_VAL0 = 7'b0100100; //A5
                        DISP_VAL1       = 7'b0001000;
                        end
8'hA6:  begin
                                DISP_VAL0 = 7'b0100000; //A6
                        DISP_VAL1       = 7'b0001000;
                        end

8'hA7:  begin
                                DISP_VAL0 = 7'b0001111; //A7
                        DISP_VAL1       = 7'b0001000;
                        end

8'hA8:  begin
                                DISP_VAL0 = 7'b0000000; //A8
                        DISP_VAL1       = 7'b0001000;
                        end

8'hA9:  begin
                                DISP_VAL0 = 7'b0001100; //A9
                        DISP_VAL1       = 7'b0001000;
                        end
8'hAA:  begin
                                DISP_VAL0 = 7'b0001000; //AA
                        DISP_VAL1       = 7'b0001000;
                        end

8'hAB:  begin
                                DISP_VAL0 = 7'b1100000; //AB
                        DISP_VAL1       = 7'b0001000;
                        end

8'hAC:  begin
```

```
                                DISP_VAL0 = 7'b0110001; //AC
                        DISP_VAL1       = 7'b0001000;
                        end

8'hAD:  begin
                                DISP_VAL0 = 7'b1000010; //AD
                        DISP_VAL1       = 7'b0001000;
                        end
8'hAE:  begin
                                DISP_VAL0 = 7'b0110000; //AE
                        DISP_VAL1       = 7'b0001000;
                        end

8'hAF:  begin
                                DISP_VAL0 = 7'b0111000; //AF
                        DISP_VAL1       = 7'b0001000;
                        end

8'hB0:  begin
                                DISP_VAL0 = 7'b0000001; //B0
                        DISP_VAL1       = 7'b1100000;
                        end

8'hB1:  begin
                                DISP_VAL0 = 7'b1001111; //B1
                        DISP_VAL1       = 7'b1100000;
                        end
8'hB2:  begin
                                DISP_VAL0 = 7'b0010010; //B2
                        DISP_VAL1       = 7'b1100000;
                        end

8'hB3:  begin
                                DISP_VAL0 = 7'b0000110; //B3
                        DISP_VAL1       = 7'b1100000;
                        end

8'hB4:  begin
                                DISP_VAL0 = 7'b1001100; //B4
                        DISP_VAL1       = 7'b1100000;
                        end

8'hB5:  begin
                                DISP_VAL0 = 7'b0100100; //B5
                        DISP_VAL1       = 7'b1100000;
                        end
8'hB6:  begin
                                DISP_VAL0 = 7'b0100000; //B6
                        DISP_VAL1       = 7'b1100000;
                        end

8'hB7:  begin
                                DISP_VAL0 = 7'b0001111; //B7
                        DISP_VAL1       = 7'b1100000;
                        end

8'hB8:  begin
                                DISP_VAL0 = 7'b0000000; //B8
                        DISP_VAL1       = 7'b1100000;
                        end

8'hB9:  begin
                                DISP_VAL0 = 7'b0001100; //B9
                        DISP_VAL1       = 7'b1100000;
                        end
8'hBA:  begin
                                DISP_VAL0 = 7'b0001000; //BA
                        DISP_VAL1       = 7'b1100000;
                        end

8'hBB:  begin
                                DISP_VAL0 = 7'b1100000; //BB
                        DISP_VAL1       = 7'b1100000;
                        end

8'hBC:  begin
                                DISP_VAL0 = 7'b0110001; //BC
                        DISP_VAL1       = 7'b1100000;
                        end

8'hBD:  begin
                                DISP_VAL0 = 7'b1000010; //BD
                        DISP_VAL1       = 7'b1100000;
                        end
8'hBE:  begin
                                DISP_VAL0 = 7'b0110000; //BE
                        DISP_VAL1       = 7'b1100000;
                        end

8'hBF:  begin
                                DISP_VAL0 = 7'b0111000; //BF
                        DISP_VAL1       = 7'b1100000;
                        end


8'hC0:  begin
                                DISP_VAL0 = 7'b0000001; //C0
                        DISP_VAL1       = 7'b0110001;
                        end

8'hC1:  begin
                                DISP_VAL0 = 7'b1001111; //C1
                        DISP_VAL1       = 7'b0110001;
                        end
8'hC2:  begin
                                DISP_VAL0 = 7'b0010010; //C2
```

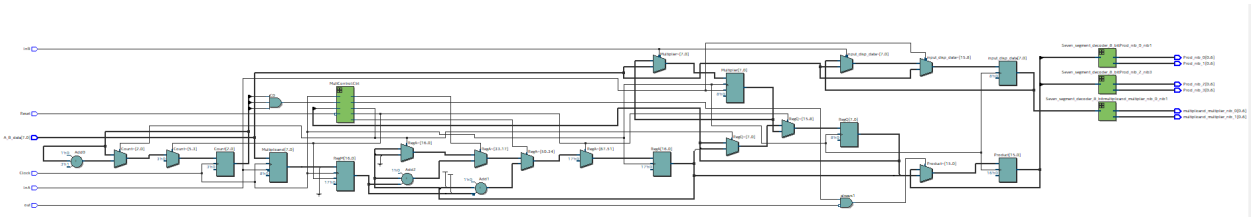
```
                        DISP_VAL1       = 7'b0110001;
                        end

8'hC3:  begin
                                        DISP_VAL0 = 7'b0000110; //C3
                        DISP_VAL1       = 7'b0110001;
                        end

8'hC4:  begin
                                        DISP_VAL0 = 7'b1001100; //C4
                        DISP_VAL1       = 7'b0110001;
                        end

8'hC5:  begin
                                        DISP_VAL0 = 7'b0100100; //C5
                        DISP_VAL1       = 7'b0110001;
                        end
8'hC6:  begin
                                        DISP_VAL0 = 7'b0100000; //C6
                        DISP_VAL1       = 7'b0110001;
                        end

8'hC7:  begin
                                        DISP_VAL0 = 7'b0001111; //C7
                        DISP_VAL1       = 7'b0110001;
                        end

8'hC8:  begin
                                        DISP_VAL0 = 7'b0000000; //C8
                        DISP_VAL1       = 7'b0110001;
                        end

8'hC9:  begin
                                        DISP_VAL0 = 7'b0001100; //C9
                        DISP_VAL1       = 7'b0110001;
                        end
8'hCA:  begin
                                        DISP_VAL0 = 7'b0001000; //CA
                        DISP_VAL1       = 7'b0110001;
                        end

8'hCB:  begin
                                        DISP_VAL0 = 7'b1100000; //CB
                        DISP_VAL1       = 7'b0110001;
                        end

8'hCC:  begin
                                        DISP_VAL0 = 7'b0110001; //CC
                        DISP_VAL1       = 7'b0110001;
                        end

8'hCD:  begin
                                        DISP_VAL0 = 7'b1000010; //CD
                        DISP_VAL1       = 7'b0110001;
                        end
8'hCE:  begin
                                        DISP_VAL0 = 7'b0110000; //CE
                        DISP_VAL1       = 7'b0110001;
                        end

8'hCF:  begin
                                        DISP_VAL0 = 7'b0111000; //CF
                        DISP_VAL1       = 7'b0110001;
                        end


8'hD0:  begin
                                        DISP_VAL0 = 7'b0000001; //D0
                        DISP_VAL1       = 7'b1000010;
                        end

8'hD1:  begin
                                        DISP_VAL0 = 7'b1001111; //D1
                        DISP_VAL1       = 7'b1000010;
                        end
8'hD2:  begin
                                        DISP_VAL0 = 7'b0010010; //D2
                        DISP_VAL1       = 7'b1000010;
                        end

8'hD3:  begin
                                        DISP_VAL0 = 7'b0000110; //D3
                        DISP_VAL1       = 7'b1000010;
                        end

8'hD4:  begin
                                        DISP_VAL0 = 7'b1001100; //D4
                        DISP_VAL1       = 7'b1000010;
                        end

8'hD5:  begin
                                        DISP_VAL0 = 7'b0100100; //D5
                        DISP_VAL1       = 7'b1000010;
                        end
8'hD6:  begin
                                        DISP_VAL0 = 7'b0100000; //D6
                        DISP_VAL1       = 7'b1000010;
                        end

8'hD7:  begin
                                        DISP_VAL0 = 7'b0001111; //D7
                        DISP_VAL1       = 7'b1000010;
                        end

8'hD8:  begin
                                        DISP_VAL0 = 7'b0000000; //D8
```

```
                        DISP_VAL1       = 7'b1000010;
                        end

8'hD9:  begin
                                        DISP_VAL0 = 7'b0001100; //D9
                        DISP_VAL1       = 7'b1000010;
                        end
8'hDA:  begin
                                        DISP_VAL0 = 7'b0001000; //DA
                        DISP_VAL1       = 7'b1000010;
                        end

8'hDB:  begin
                                        DISP_VAL0 = 7'b1100000; //DB
                        DISP_VAL1       = 7'b1000010;
                        end

8'hDC:  begin
                                        DISP_VAL0 = 7'b0110001; //DC
                        DISP_VAL1       = 7'b1000010;
                        end

8'hDD:  begin
                                        DISP_VAL0 = 7'b1000010; //DD
                        DISP_VAL1       = 7'b1000010;
                        end
8'hDE:  begin
                                        DISP_VAL0 = 7'b0110000; //DE
                        DISP_VAL1       = 7'b1000010;
                        end

8'hDF:  begin
                                        DISP_VAL0 = 7'b0111000; //DF
                        DISP_VAL1       = 7'b1000010;
                        end

8'hE0:  begin
                                        DISP_VAL0 = 7'b0000001; //E0
                        DISP_VAL1       = 7'b0110000;
                        end

8'hE1:  begin
                                        DISP_VAL0 = 7'b1001111; //E1
                        DISP_VAL1       = 7'b0110000;
                        end
8'hE2:  begin
                                        DISP_VAL0 = 7'b0010010; //E2
                        DISP_VAL1       = 7'b0110000;
                        end

8'hE3:  begin
                                        DISP_VAL0 = 7'b0000110; //E3
                        DISP_VAL1       = 7'b0110000;
                        end

8'hE4:  begin
                                        DISP_VAL0 = 7'b1001100; //E4
                        DISP_VAL1       = 7'b0110000;
                        end

8'hE5:  begin
                                        DISP_VAL0 = 7'b0100100; //E5
                        DISP_VAL1       = 7'b0110000;
                        end
8'hE6:  begin
                                        DISP_VAL0 = 7'b0100000; //E6
                        DISP_VAL1       = 7'b0110000;
                        end

8'hE7:  begin
                                        DISP_VAL0 = 7'b0001111; //E7
                        DISP_VAL1       = 7'b0110000;
                        end

8'hE8:  begin
                                        DISP_VAL0 = 7'b0000000; //E8
                        DISP_VAL1       = 7'b0110000;
                        end

8'hE9:  begin
                                        DISP_VAL0 = 7'b0001100; //E9
                        DISP_VAL1       = 7'b0110000;
                        end
8'hEA:  begin
                                        DISP_VAL0 = 7'b0001000; //EA
                        DISP_VAL1       = 7'b0110000;
                        end

8'hEB:  begin
                                        DISP_VAL0 = 7'b1100000; //EB
                        DISP_VAL1       = 7'b0110000;
                        end

8'hEC:  begin
                                        DISP_VAL0 = 7'b0110001; //EC
                        DISP_VAL1       = 7'b0110000;
                        end

8'hED:  begin
                                        DISP_VAL0 = 7'b1000010; //ED
                        DISP_VAL1       = 7'b0110000;
                        end
8'hEE:  begin
                                        DISP_VAL0 = 7'b0110000; //EE
                        DISP_VAL1       = 7'b0110000;
                        end
```

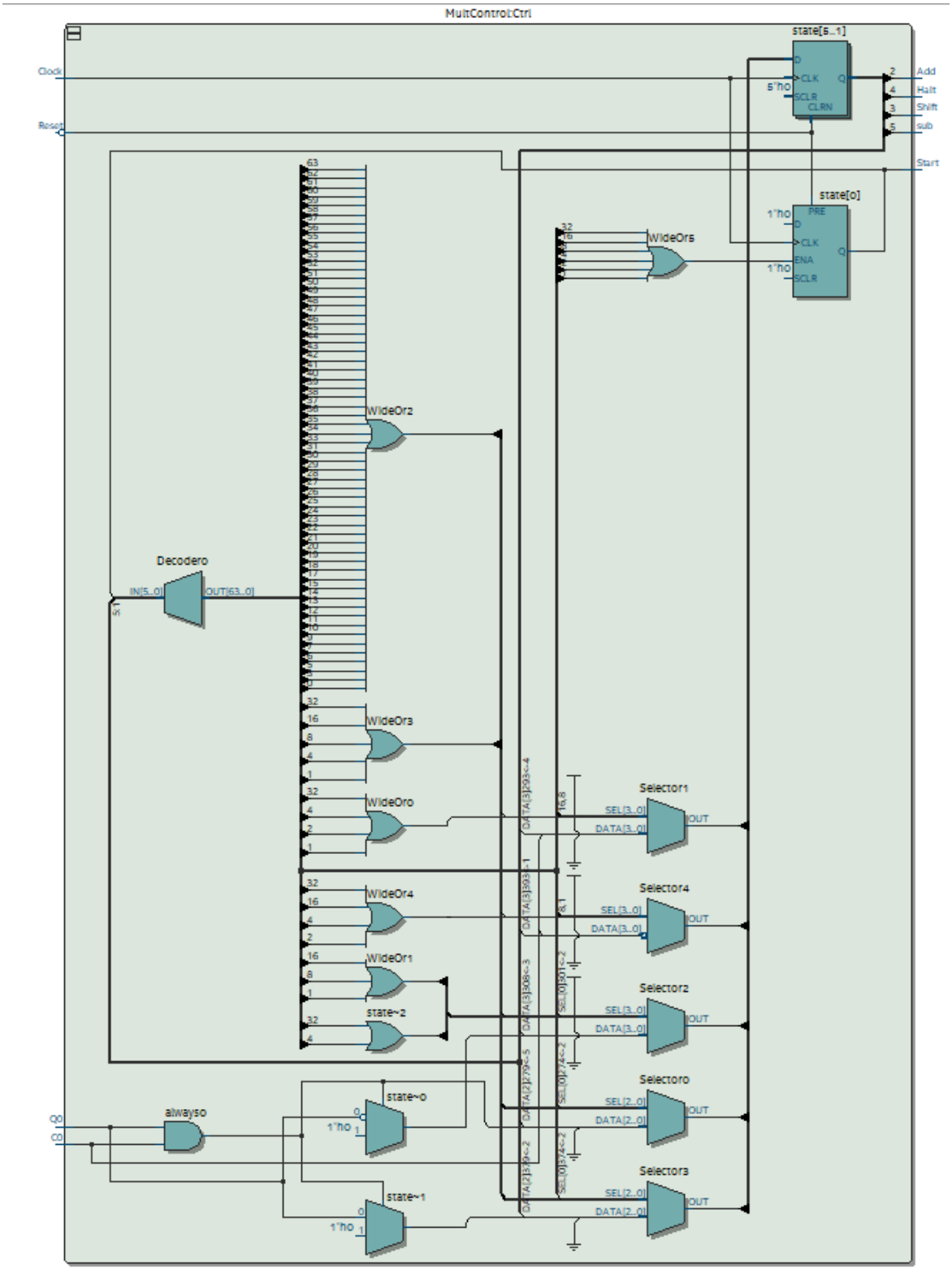
```
                8'hEF: begin
                                                DISP_VAL0 = 7'b0111000; //EF
                                        DISP_VAL1       = 7'b0110000;
                                        end


                8'hF0: begin
                                                DISP_VAL0 = 7'b0000001; //F0
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hF1: begin
                                                DISP_VAL0 = 7'b1001111; //F1
                                        DISP_VAL1       = 7'b0111000;
                                        end
                8'hF2: begin
                                                DISP_VAL0 = 7'b0010010; //F2
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hF3: begin
                                                DISP_VAL0 = 7'b0000110; //F3
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hF4: begin
                                                DISP_VAL0 = 7'b1001100; //F4
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hF5: begin
                                                DISP_VAL0 = 7'b0100100; //F5
                                        DISP_VAL1       = 7'b0111000;
                                        end
                8'hF6: begin
                                                DISP_VAL0 = 7'b0100000; //F6
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hF7: begin
                                                DISP_VAL0 = 7'b0001111; //F7
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hF8: begin
                                                DISP_VAL0 = 7'b0000000; //F8
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hF9: begin
                                                DISP_VAL0 = 7'b0001100; //F9
                                        DISP_VAL1       = 7'b0111000;
                                        end
                8'hFA: begin
                                                DISP_VAL0 = 7'b0001000; //FA
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hFB: begin
                                                DISP_VAL0 = 7'b1100000; //FB
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hFC: begin
                                                DISP_VAL0 = 7'b0110001; //FC
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hFD: begin
                                                DISP_VAL0 = 7'b1000010; //FD
                                        DISP_VAL1       = 7'b0111000;
                                        end
                8'hFE: begin
                                                DISP_VAL0 = 7'b0110000; //FE
                                        DISP_VAL1       = 7'b0111000;
                                        end

                8'hFF: begin
                                                DISP_VAL0 = 7'b0111000; //FF
                                        DISP_VAL1       = 7'b0111000;
                                        end

                default:begin DISP_VAL0 = 7'b0000000; DISP_VAL1 = 7'b0000000; end//OFF
        endcase
endmodule
```

5. RTL DIAGRAMS :

Eight_Bit_Multiplier:



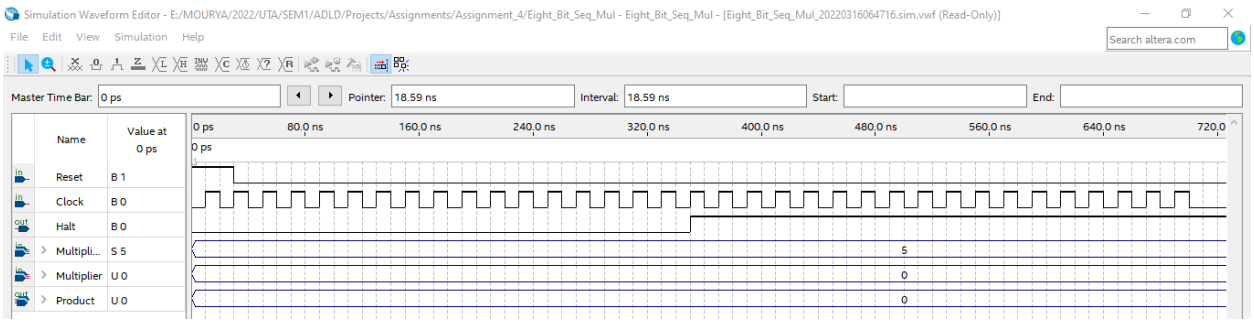
MultControl:



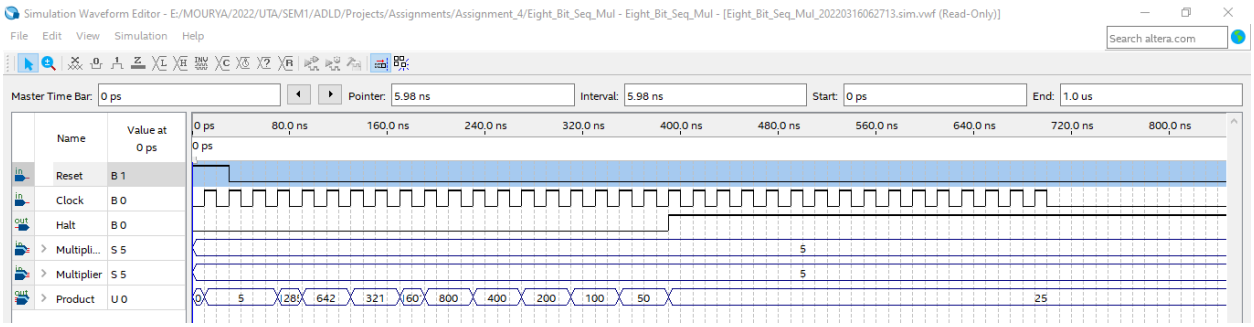
6. Simulation Results Wave Forms :

Unsigned Version Simulation Results :

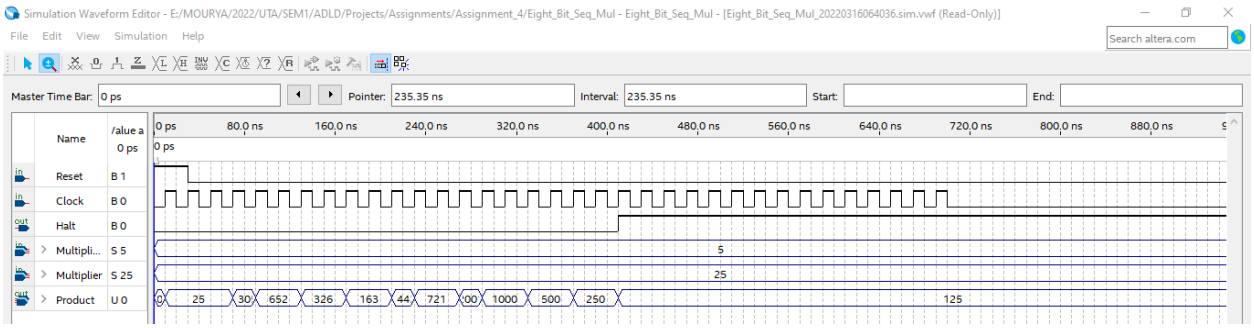
Multiplicand = 5,Multiplier = 0,Product =0,Clock Cycles = 16



Multiplicand = 5,Multiplier = 5, Product =25,Clock Cycles = 18

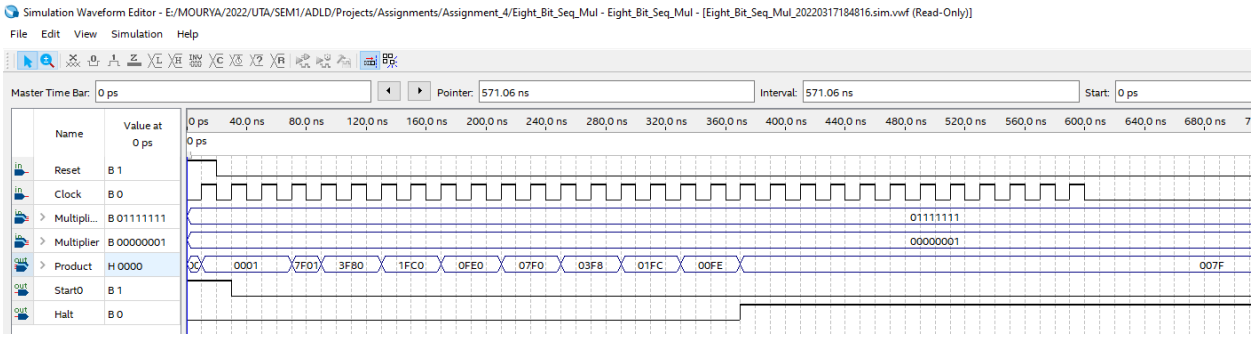


Multiplicand = 5,Multiplier = 25, Product =125,Clock Cycles = 19

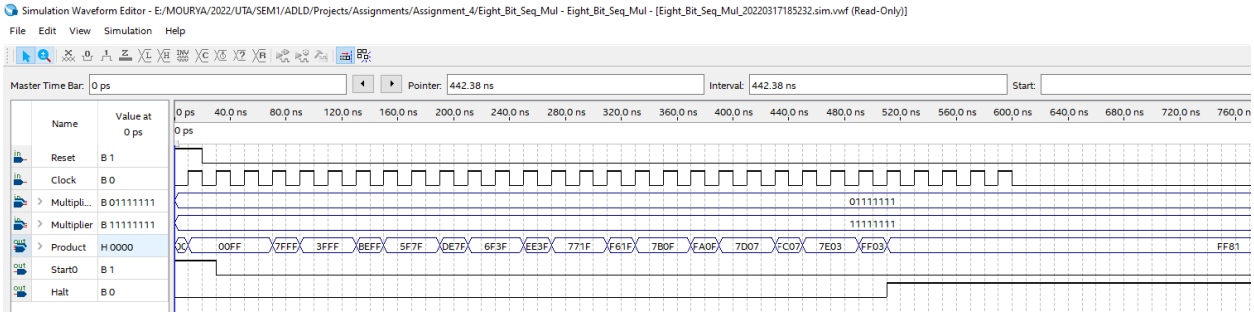


Signed Version Simulation Results:

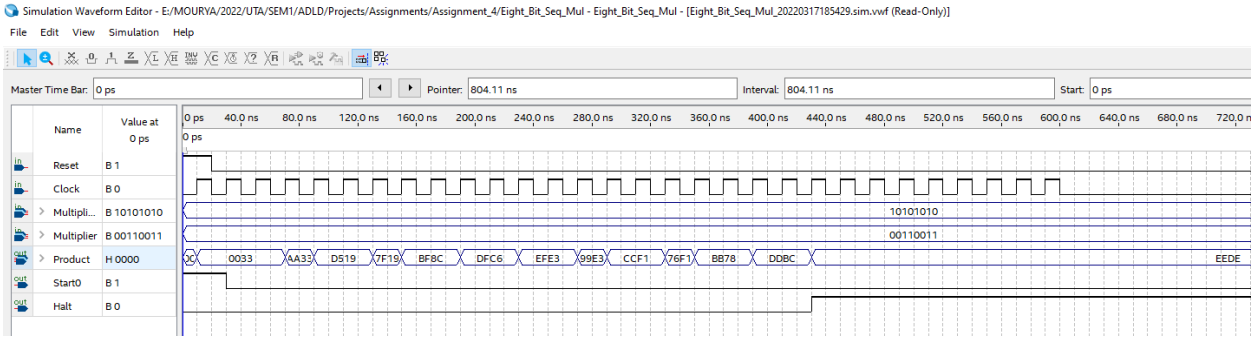
Multiplicand = 0x7F,Multiplier = 0x01,Product =0x007F,Clock Cycles = 17



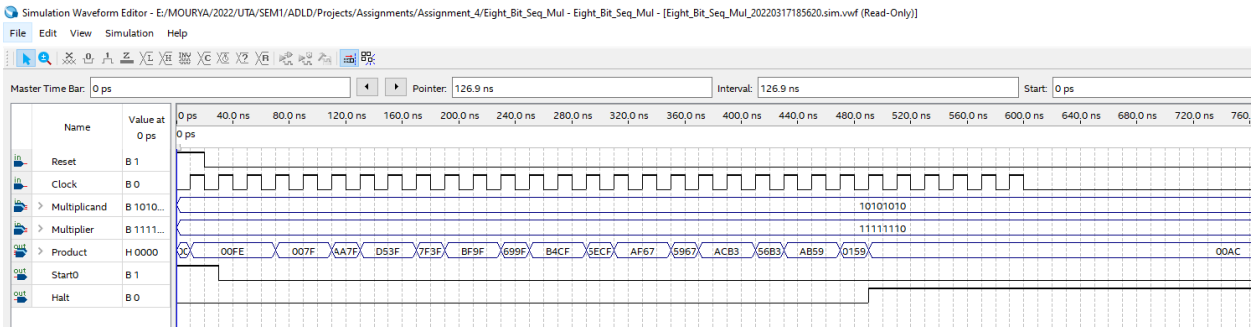
Multiplicand = 0x7F,Multiplier = 0xFF,Product =0xFF81,Clock Cycles = 24



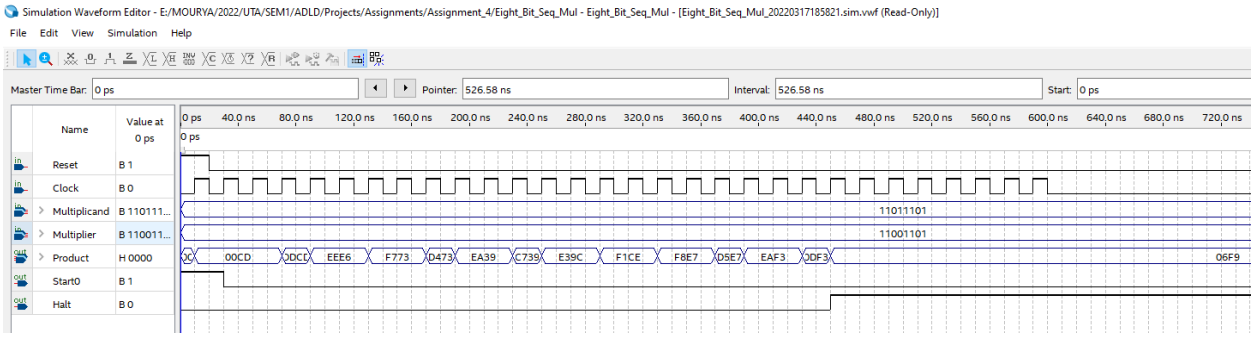
Multiplicand = 0xAA,Multiplier = 0x33,Product =0xEEDE,Clock Cycles = 20



Multiplicand = 0xAA,Multiplier = 0xFE,Product =0x00AC,Clock Cycles = 23



Multiplicand = 0xDD,Multiplier = 0xCD,Product =0x06F9,Clock Cycles = 21



7. PIN ASSIGNMENTS:

```
set_location_assignment PIN_AC9      -to A_B_data[7]
set_location_assignment PIN_AE11     -to A_B_data[6]
set_location_assignment PIN_AD12     -to A_B_data[5]
set_location_assignment PIN_AD11     -to A_B_data[4]
set_location_assignment PIN_AF10     -to A_B_data[3]
set_location_assignment PIN_AF9      -to A_B_data[2]
set_location_assignment PIN_AC12     -to A_B_data[1]
set_location_assignment PIN_AB12     -to A_B_data[0]
set_location_assignment PIN_AF14     -to Clock
set_location_assignment PIN_AA14     -to lnA
set_location_assignment PIN_AA15     -to lnB
set_location_assignment PIN_W15      -to Reset
set_location_assignment PIN_Y16      -to out
set_location_assignment PIN_AE26     -to Prod_nib_0[0]
set_location_assignment PIN_AE27     -to Prod_nib_0[1]
set_location_assignment PIN_AE28     -to Prod_nib_0[2]
set_location_assignment PIN_AG27     -to Prod_nib_0[3]
set_location_assignment PIN_AF28     -to Prod_nib_0[4]
set_location_assignment PIN_AG28     -to Prod_nib_0[5]
set_location_assignment PIN_AH28     -to Prod_nib_0[6]
set_location_assignment PIN_AJ29     -to Prod_nib_1[0]
set_location_assignment PIN_AH29     -to Prod_nib_1[1]
set_location_assignment PIN_AH30     -to Prod_nib_1[2]
set_location_assignment PIN_AG30     -to Prod_nib_1[3]
set_location_assignment PIN_AF29     -to Prod_nib_1[4]
set_location_assignment PIN_AF30     -to Prod_nib_1[5]
set_location_assignment PIN_AD27     -to Prod_nib_1[6]
set_location_assignment PIN_AB23     -to Prod_nib_2[0]
set_location_assignment PIN_AE29     -to Prod_nib_2[1]
set_location_assignment PIN_AD29     -to Prod_nib_2[2]
set_location_assignment PIN_AC28     -to Prod_nib_2[3]
set_location_assignment PIN_AD30     -to Prod_nib_2[4]
set_location_assignment PIN_AC29     -to Prod_nib_2[5]
set_location_assignment PIN_AC30     -to Prod_nib_2[6]
set_location_assignment PIN_AD26     -to Prod_nib_3[0]
set_location_assignment PIN_AC27     -to Prod_nib_3[1]
set_location_assignment PIN_AD25     -to Prod_nib_3[2]
set_location_assignment PIN_AC25     -to Prod_nib_3[3]
set_location_assignment PIN_AB28     -to Prod_nib_3[4]
set_location_assignment PIN_AB25     -to Prod_nib_3[5]
set_location_assignment PIN_AB22     -to Prod_nib_3[6]
set_location_assignment PIN_AA24     -to multiplicand_multiplier_nib_0[0]
set_location_assignment PIN_Y23      -to multiplicand_multiplier_nib_0[1]
set_location_assignment PIN_Y24      -to multiplicand_multiplier_nib_0[2]
set_location_assignment PIN_W22      -to multiplicand_multiplier_nib_0[3]
set_location_assignment PIN_W24      -to multiplicand_multiplier_nib_0[4]
```

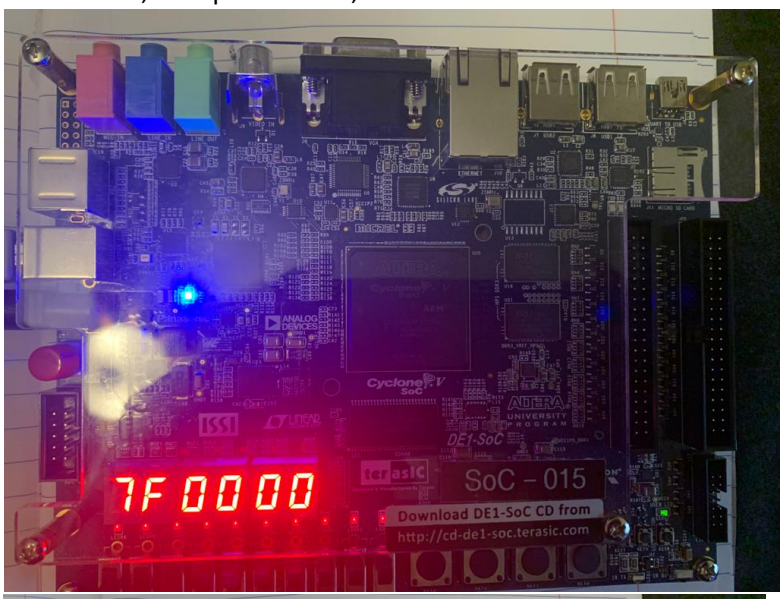
```
set_location_assignment PIN_V23      -to multiplicand_multiplier_nib_0[5]
set_location_assignment PIN_W25      -to multiplicand_multiplier_nib_0[6]
set_location_assignment PIN_V25      -to multiplicand_multiplier_nib_1[0]
set_location_assignment PIN_AA28     -to multiplicand_multiplier_nib_1[1]
set_location_assignment PIN_Y27      -to multiplicand_multiplier_nib_1[2]
set_location_assignment PIN_AB27     -to multiplicand_multiplier_nib_1[3]
set_location_assignment PIN_AB26     -to multiplicand_multiplier_nib_1[4]
set_location_assignment PIN_AA26     -to multiplicand_multiplier_nib_1[5]
set_location_assignment PIN_AA25     -to multiplicand_multiplier_nib_1[6]
```

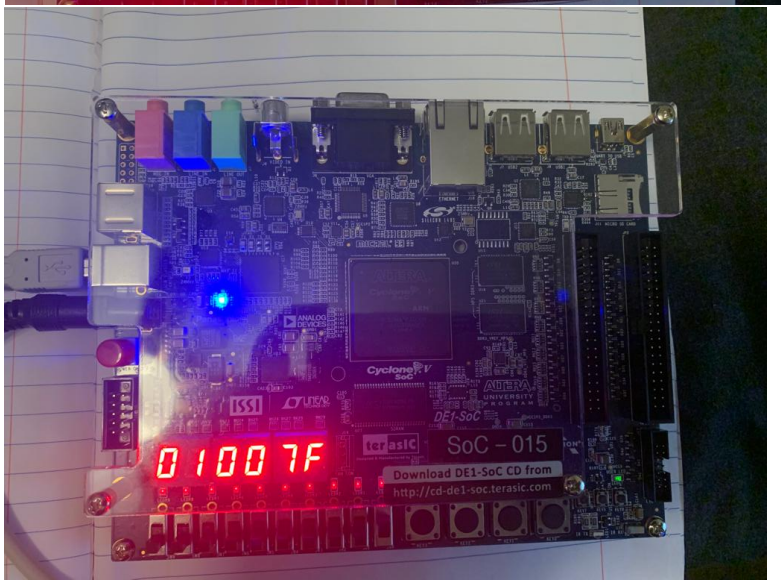
8. TEST RESULTS:

Multiplicand (HEX5,4)	Multiplier (HEX5,4)	Product (HEX3,2,1,0)	Clock Cycles Taken (Observed in Simulation)
0x7F	0x01	0x007F	17
0x7F	0xFF	0xFF81	24
0xAA	0x33	0xEEDE	20
0xAA	0xFE	0x00AC	23
0xDD	0xCD	0x06F9	21

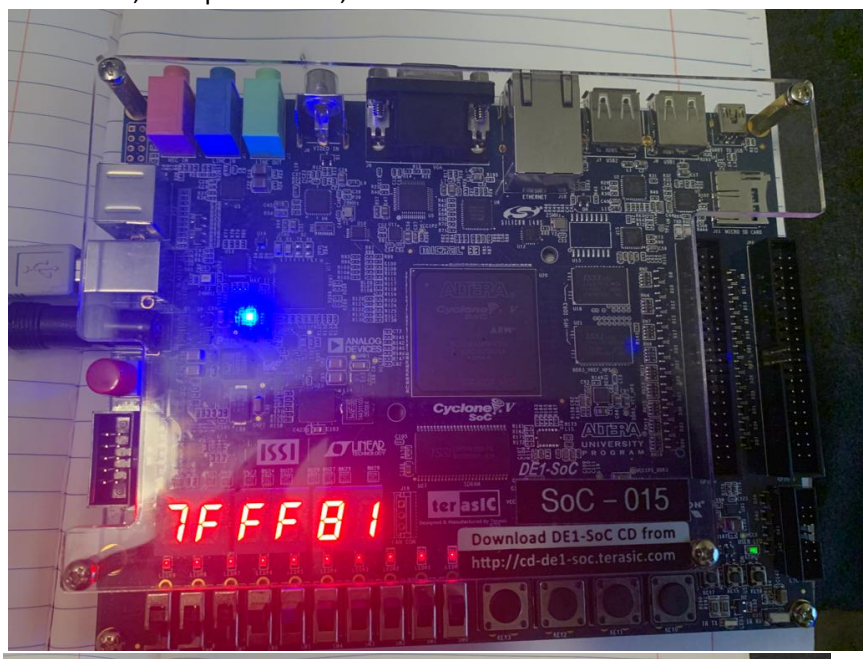
9.Photos Of Test Results

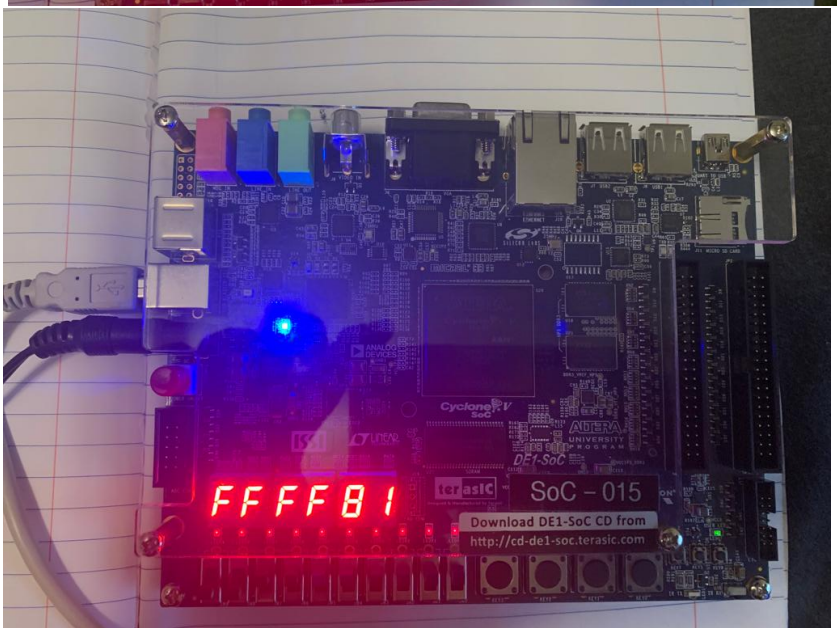
Multiplicand = 0x7F,Multiplier = 0x01,Product =0x007F



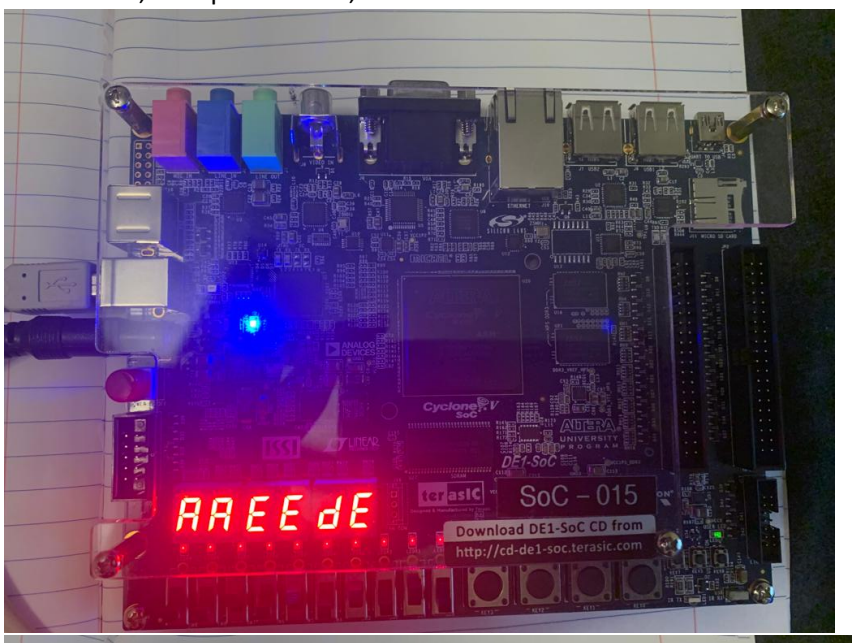


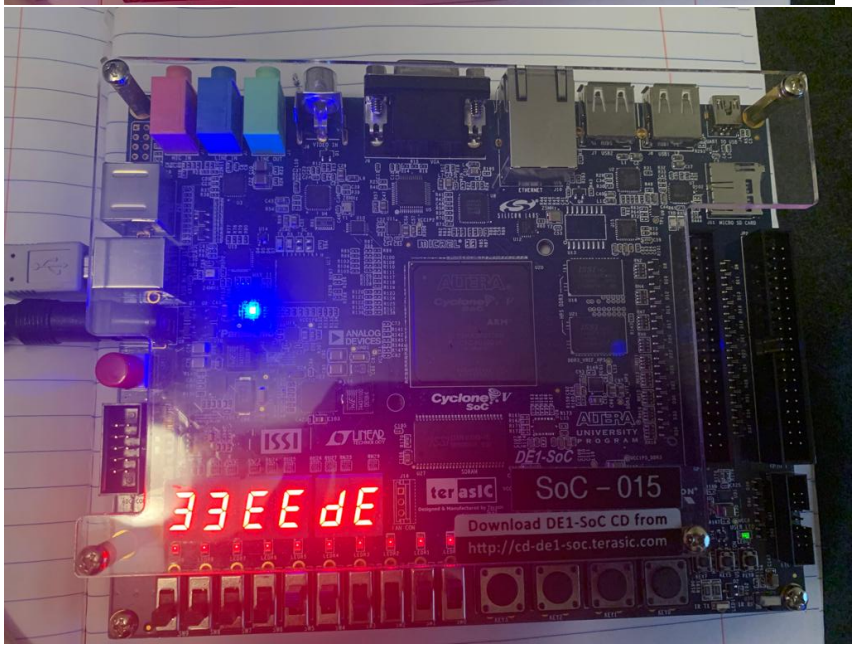
Multiplicand = 0x7F,Multiplier = 0xFF,Product =0xFF81



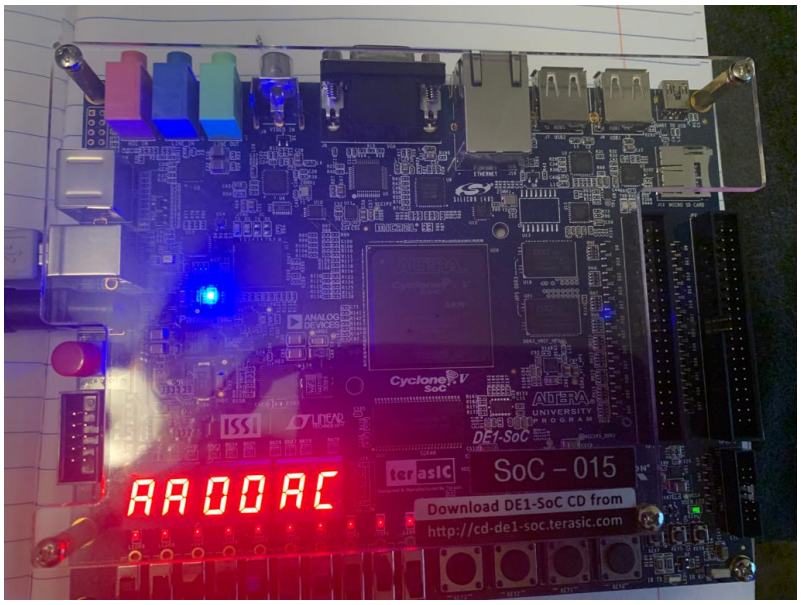


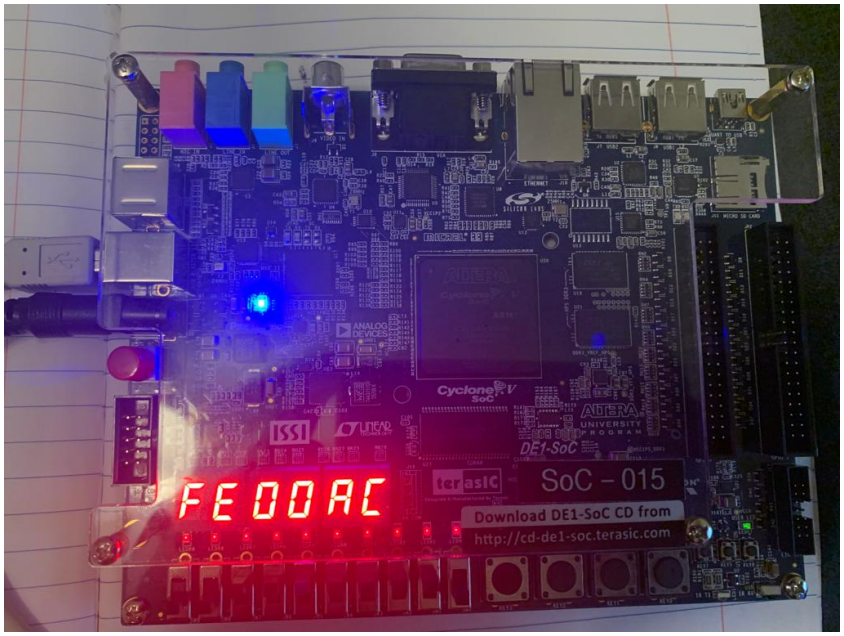
Multiplicand = 0xAA,Multiplier = 0x33,Product =0xEEDE



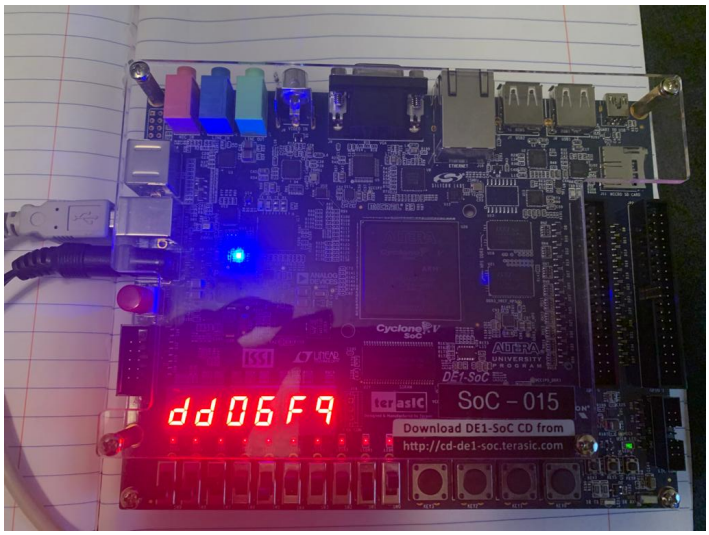


Multiplicand = 0xAA,Multiplier = 0xFE,Product =0x00AC





Multiplicand = 0xDD,Multiplier = 0xCD,Product =0x06F9


dd06F9
SoC - 015
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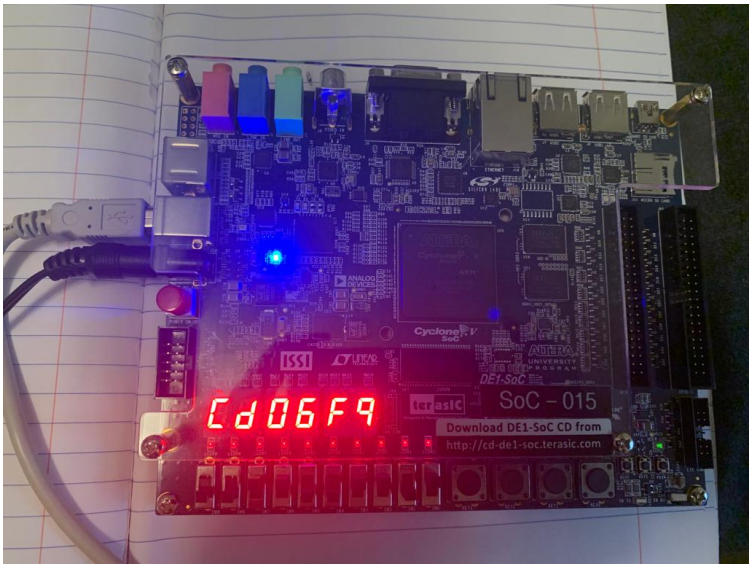
http://cd-de1-soc.terasic.com


CdD6F9
SoC - 015
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