Some draft explaining the GCD machine code to make you understand more while you try to trace in modelsim waveform:

00008020	00000000000000010000000000100000		
20100078	00100000000100000000000001111000	78h , 120d	
00008820	00000000000000010001000000100000		
201100b4	00100000000100010000000010110100	B4h , 180d	
00009020	00000000000000010010000000100000		
12110006	00010010000100010000000000000110		
0211482a	00000010000100010100100000101010		
11200002	00010001001000000000000000000010		
02308822	00000010001100001000100000100010		
08000005	00001000000000000000000000000101		
02118022	00000010000100011000000000100010		
08000005	00001000000000000000000000000101		
00109020	00000000000010000100100000100000		
Ac120000	10101100000100100000000000000000		

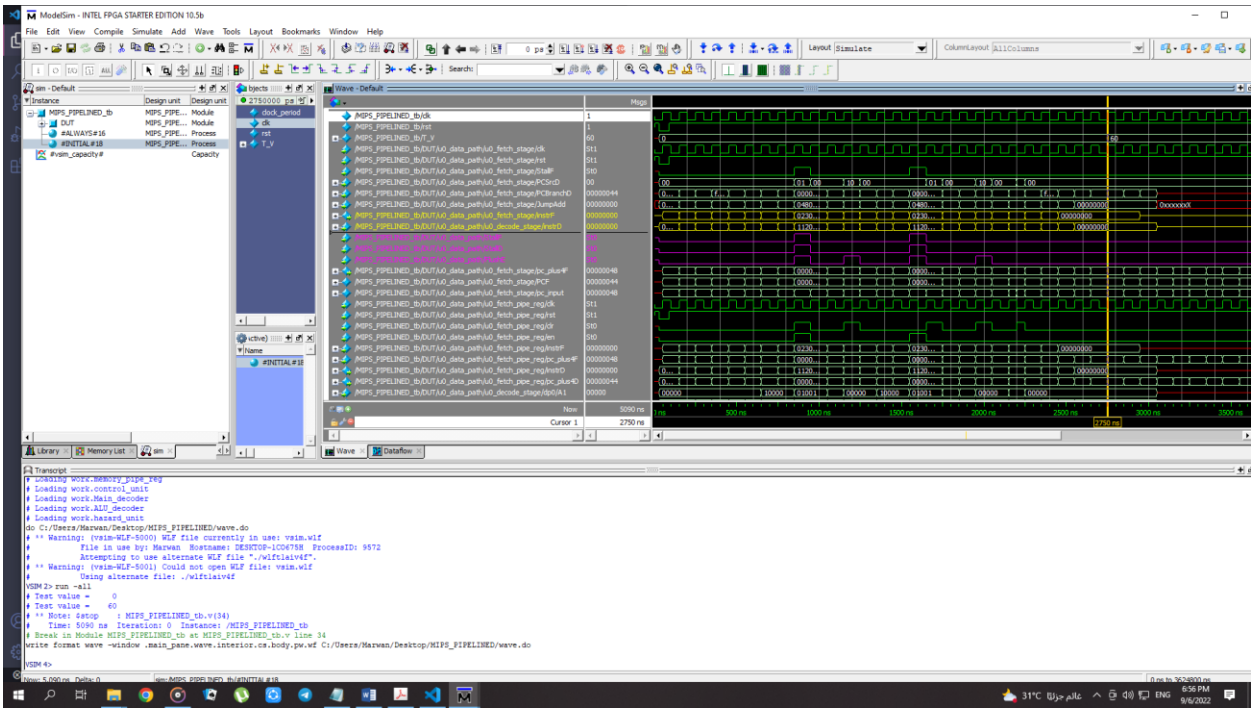
Red: op code, blue: Alu funct, green: immediate value (ex 78, B4)

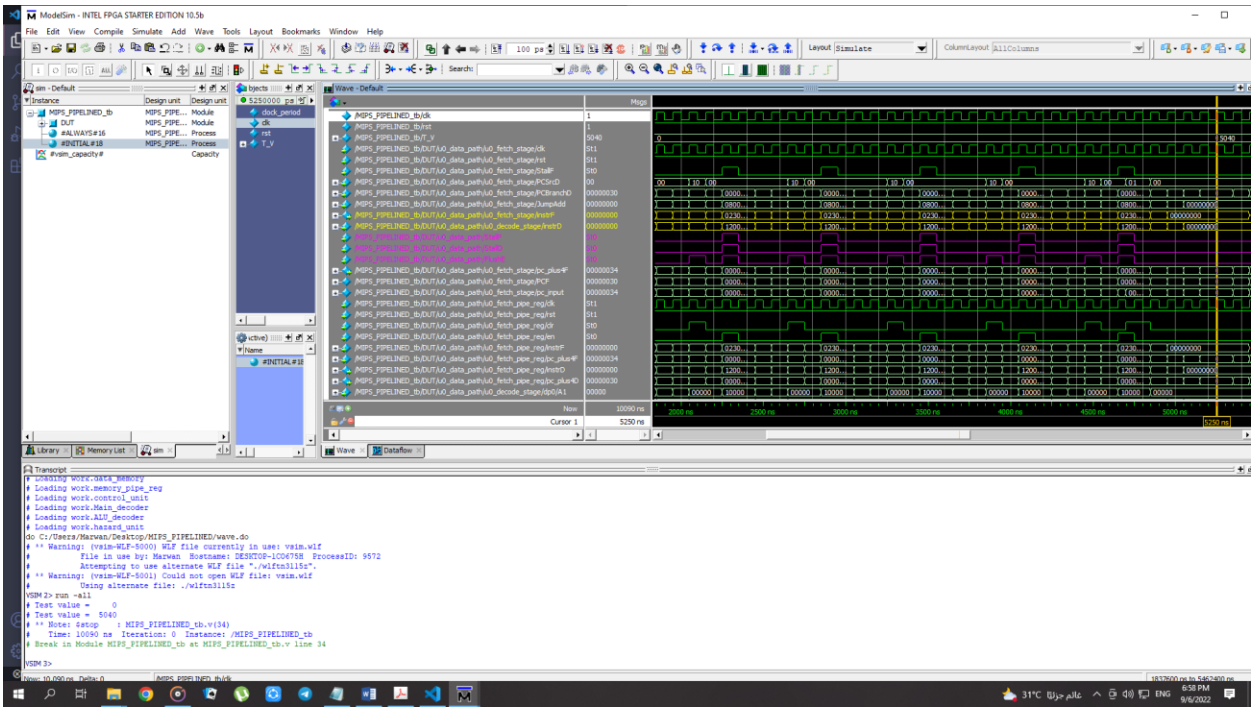
RsD(A1), RtD(A2), RdD

opCode	jump	aluOp	memWrite	regWrite	regDest	aluSrc	memtoReg	Branch
loadWord = 6'b10_0011	0	00	0	1	0	1	1	0
storeWord **= 6'b10_1011**	0	00	1	0	0	1	1	0
rType = 6'b00_0000	0	10	0	1	1	0	0	0
addImmediate = 6'b00_1000	0	00	0	1	0	1	0	0
branchIfEqual = 6'b00_0100	0	01	0	0	0	0	0	1
jump_inst = 6'b00_0010	1	00	0	0	0	0	0	0
Default	0	00	0	0	0	0	0	0

ALUOp	Funct	ALUControl	Function
00	xxxxxx	010	A + B
01	xxxxxx	100	A - B
10	add = 6'b10_0000	010	A + B
	sub = 6'b10_0010	100	A - B
	slt = 6'b10_1010	110	SLT[1]
	mul = 6'b01_1100	101	A * B
Default	xxxxxx	010	A + B

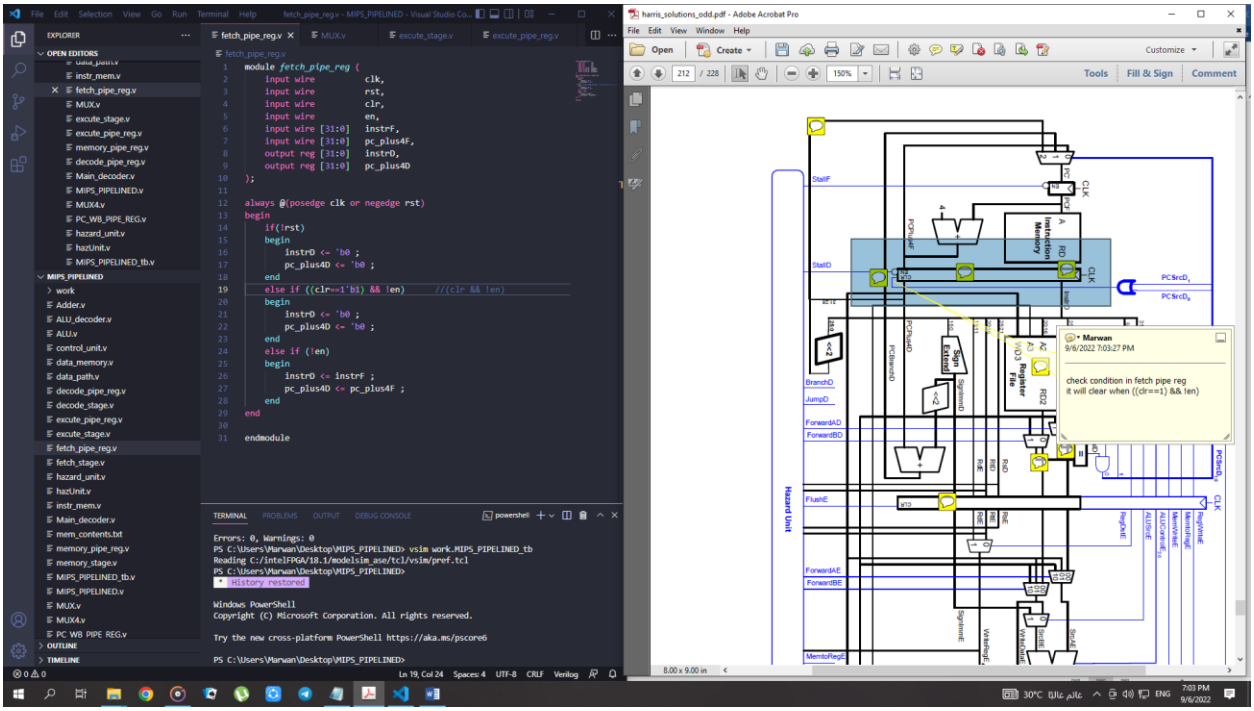
[1] SLT is an abbreviation for **Set Less Than.** This function is responsible for setting the output ALUResult to 1 when SrcA is less than SrcB otherwise ALUResult is set to 0.





Important notes:

Clear condition in the pipe reg



Register file has negedge clock