

EEE 415 – Microprocessor and Embedded Systems (January 2021)

Dr. Sajid Muhaimin Choudhury

CONTINUOUS ASSESSMENT-1 (FOR SECTION A, B, C)

Marks: 20

Problem

1. Implement a 4 bit computer in VerilogHDL with the given instruction set. The instruction set will depend on your student ID's last digit. Your implementation should be done in a single Verilog hdl file.
2. Write appropriate test conditions for your microprocessor to demonstrate its capabilities. You should generate vector waveform files.
3. Prepare a demonstration video of your computer using Powerpoint, ScreenCapture and simulation. Upload the video in Microsoft Stream.

Submission

1. Report on the 4-bit computer, explaining the instruction set, any unique features and waveforms of the output, acceptable format is PDF. Report must be renamed as EEE315_4bit_StudentID.pdf
2. Video link of the Microsoft Stream video. The video must be shared with Dr. Sajid M Choudhury and Sameia Zaman. Video title in Microsoft stream must start "EEE 415 (Jan 2021) - 4 Bit Computer Design – StudentID "and feel free to add more texts to emphasize your particular design. Your powerpoint file in #3 should have the link, and use this [Office form](#) to also submit the link.
3. Powerpoint presentation file for the video presentation. File should be named as EEE415J2021_4bit_StudentID.pptx ([Click here for form link](#))
4. All design files, test bench files, codes and PowerPoint presentation (if any) s in a single zip file. The zip file must be named as EEE415J2021_StudentID.zip;

Grading Criteria

1. Unique and your own design. Partial credit will be given to even incomplete designs; however, copied / plagiarized designs will be given zero.
2. Video length should be less than 5 minutes. 20% grading penalty for any video longer than 5 minutes
3. Punctuality. Late submission will be penalized with a 20% deduction of points.
4. Audio and Video quality – you must be clearly audible in the recording. Speak clearly and explain the concepts properly.

Bonus grading:

1. Unique features (please emphasize on the video)
2. Implement Pipelining
3. Use open-source tools for your design (EDA Playground)
4. Implement an assembler for your computer using Matlab/Python

Instruction Set:

Roll XX1

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	MOV A,[ADDRESS]
5	OUT A
6	INC A
7	RCR A
8	MOV A,BYTE
9	JNZ ADDRESS
10	PUSH B
11	POP B
12	CALL ADDRESS
13	RET
14	OR A,[ADDRESS]
15	XOR A,[ADDRESS]
16	HLT

Roll XX4

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	MOV B,[ADDRESS]
5	OUT B
6	JNZ ADDRESS
7	RCR A
8	MOV B,BYTE
9	JMP ADDRESS
10	PUSH A
11	POP A
12	CALL ADDRESS
13	RET
14	XOR A,[ADDRESS]
15	TEST B,BYTE
16	HLT

Roll XX2

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	MOV B,BYTE
5	RCR B
6	JMP ADDRESS
7	JNZ ADDRESS
8	PUSHF
9	OR A,BYTE
10	PUSH B
11	POP B
12	OUT A
13	CALL ADDRESS
14	RET
15	AND A,[ADDRESS]
16	HLT

Roll XX5

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	IN A
5	RCR B
6	DEC B
7	JZ ADDRESS
8	JMP ADDRESS
9	OR B,BYTE
10	PUSH B
11	POP B
12	OUT A
13	CALL ADDRESS
14	RET
15	AND A,[ADDRESS]
16	HLT

Roll XX3

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	IN A
5	OUT A
6	INC A
7	MOV A,[ADDRESS]
8	MOV A,BYTE
9	JZ ADDRESS
10	PUSH B
11	POP B
12	RCL B
13	CALL ADDRESS
14	RET
15	AND A,[ADDRESS]
16	HLT

Roll XX6

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	RCL A
5	OUT A
6	INC A
7	MOV B,[ADDRESS]
8	MOV B,BYTE
9	JMP ADDRESS
10	PUSH B
11	POP B
12	NOT A
13	CALL ADDRESS
14	RET
15	TEST A,B
16	HLT

Roll XX7

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	MOV A,[ADDRESS]
5	MOV [ADDRESS],B
6	OUT A
7	TEST B,A
8	OR B,[ADDRESS]
9	JNZ ADDRESS
10	JMP ADDRESS
11	PUSHF
12	PUSH A
13	POP A
14	CALL ADDRESS
15	RET
16	HLT

Roll XX8

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	RCL B
5	SHR A
6	MOV [ADDRESS],A
7	XOR A,[ADDRESS]
8	AND A,B
9	OR B,[ADDRESS]
10	OUT A
11	JZ ADDRESS
12	PUSH B
13	POP B
14	CALL ADDRESS
15	RET
16	HLT

Roll XX0

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	MOV A,[ADDRESS]
5	RCR B
6	IN A
7	OUT A
8	AND A,B
9	TEST B,BYTE
10	OR B,BYTE
11	XOR A,[ADDRESS]
12	PUSH B
13	POP B
14	CALL ADDRESS
15	RET
16	HLT

Roll XX9

1	ADD A,B
2	SUB A,B
3	XCHG B,A
4	MOV A,[ADDRESS]
5	MOV [ADDRESS],B
6	JNZ ADDRESS
7	XOR A,[ADDRESS]
8	PUSHF
9	IN B
10	OUT A
11	JMP ADDRESS
12	PUSH A
13	POP A
14	CALL ADDRESS
15	RET
16	HLT