

Programs: Electrical & Computer Engineering

Course Number	COE608
Course Title	Computer Organization and Architecture
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Instructor	Dr. Vadim Geurkov

Lab Report No.	6
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Report Title	The Complete CPU (Overall Project)
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Section No.	3
Group No.	
Submission Date	Apr 4, 2025
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<https://www.torontomu.ca/content/dam/senate/policies/pol60.pdf>

Table of Contents

Introduction.....	2
Results.....	2
Conclusion.....	17
References.....	18

Introduction

This report is for Lab 6, The Complete CPU (Overall Project). This lab is what all the previous labs were leading up to, since now all the components needed to make a basic RISC-V are complete. The only additional thing needed is the Reset Circuit.

Results

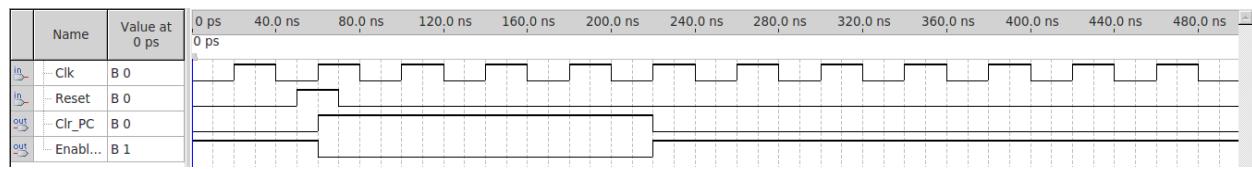


Figure 1: Reset Circuit waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	0000AAAA	20000001	75000000	90000001	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 2: mif File Settings for LDAI, STA, CLRA, and LDA waveforms

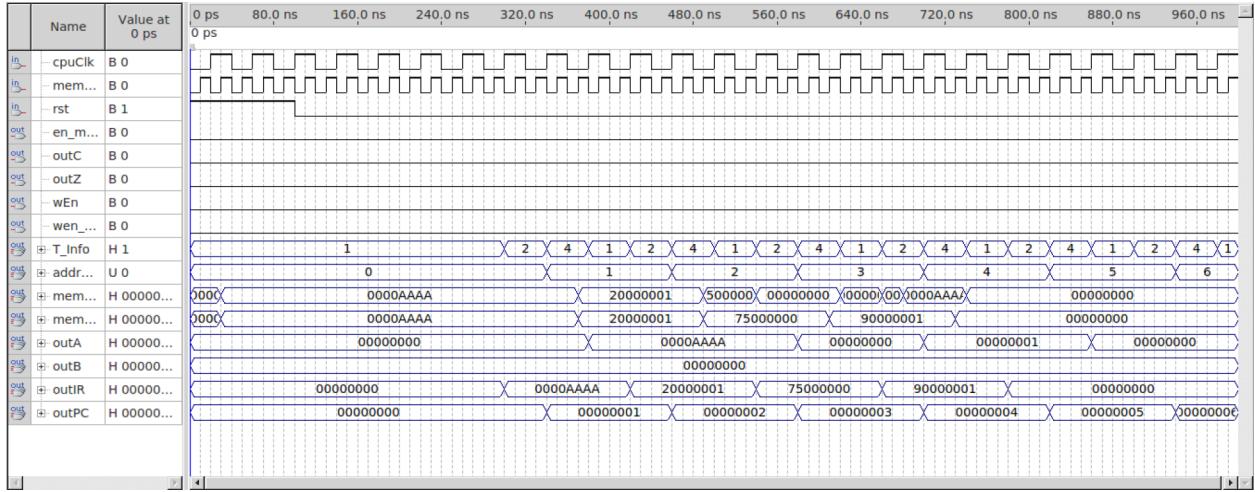


Figure 3: Functional LDAI, STA, CLRA, and LDA waveform

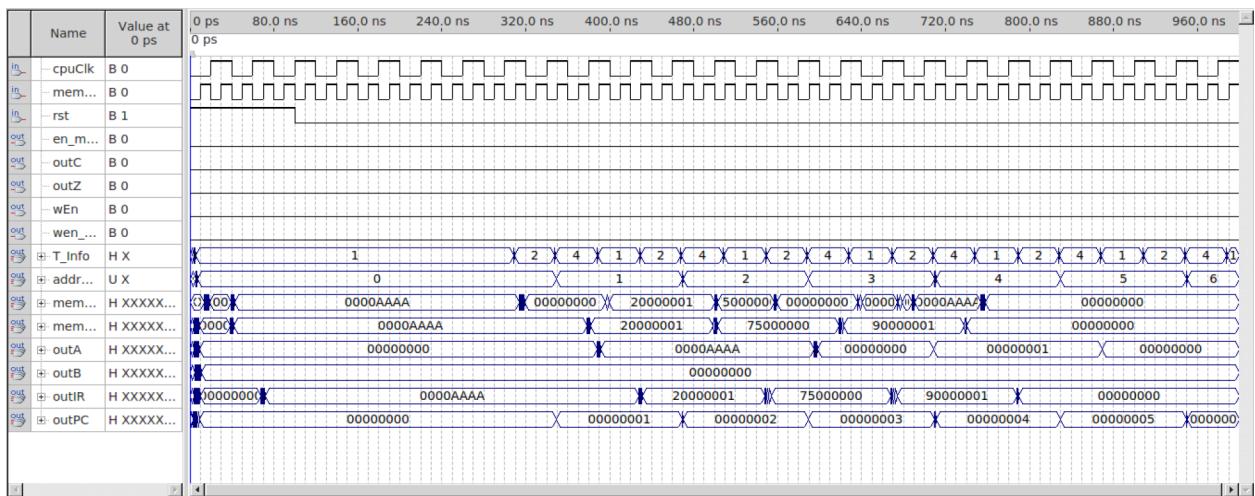


Figure 4: Time-sensitive LDAI, STA, CLRA, and LDA waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	1000BBBB	30000001	76000000	A0000001	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 5: mif File Settings for LDBI, STB, CLRB, and LDB waveforms

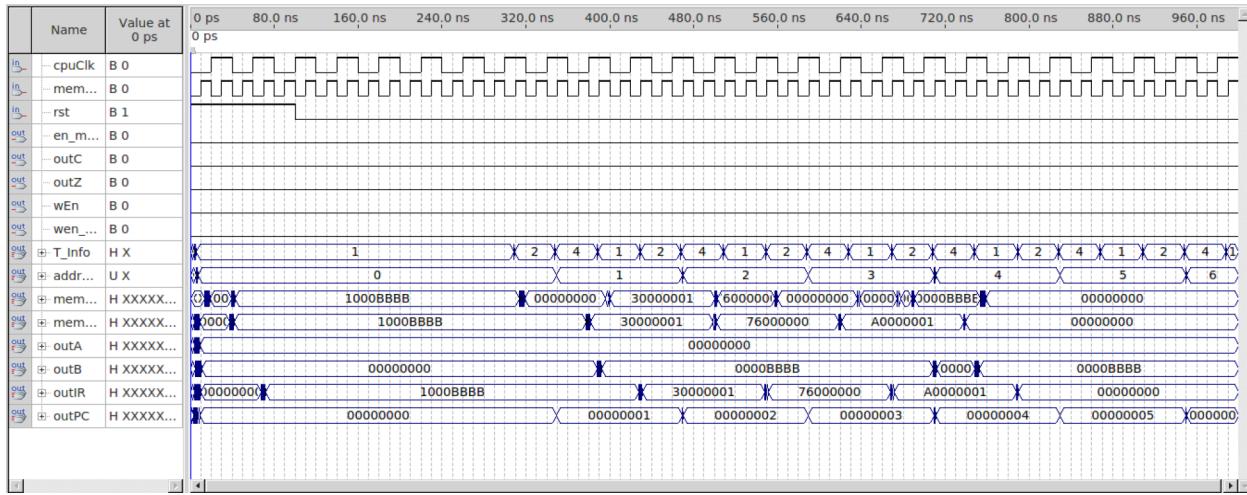


Figure 6: Time-sensitive LDBI, STB, CLRB, and LDB waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	4000AAAA	00000000	00000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 7: mif File Settings for LUI waveform

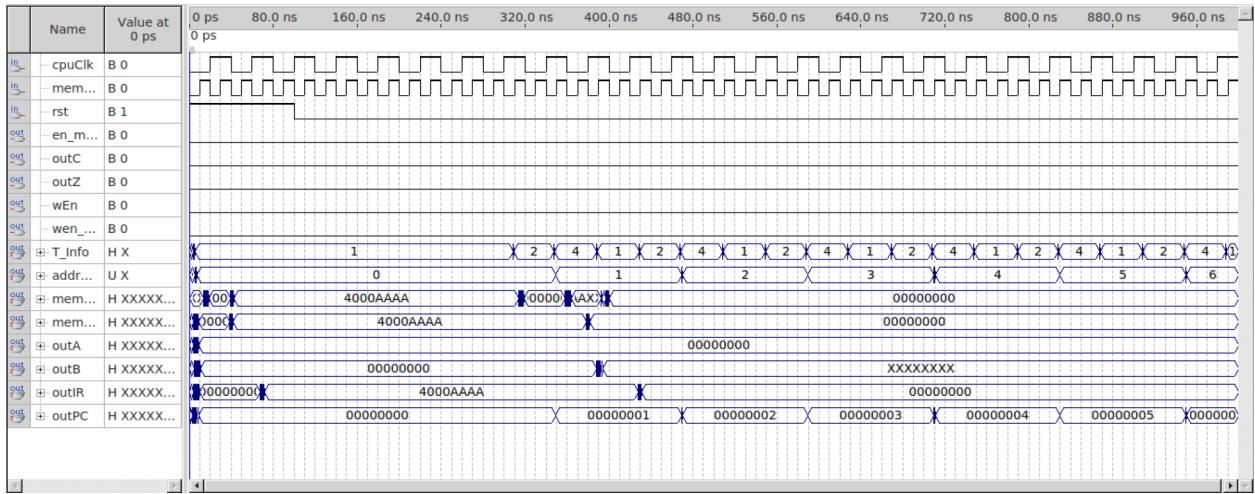


Figure 8: Time-sensitive LUI waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	5000AAAA	00000000	00000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 9: mif File Settings for JMP waveform

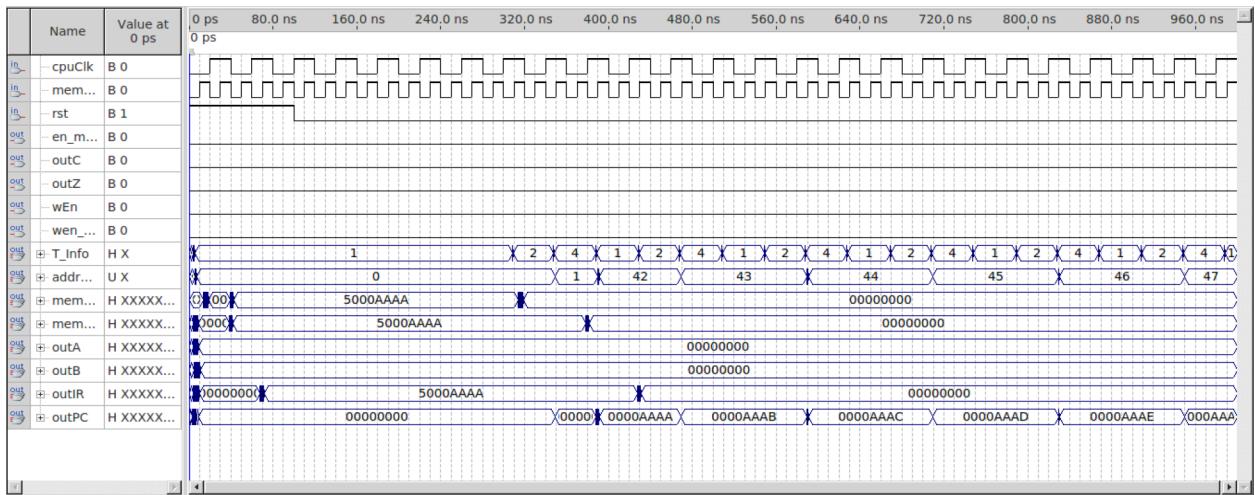


Figure 10: Time-sensitive JMP waveform

Figure 11: mif File Settings for ANDI waveform

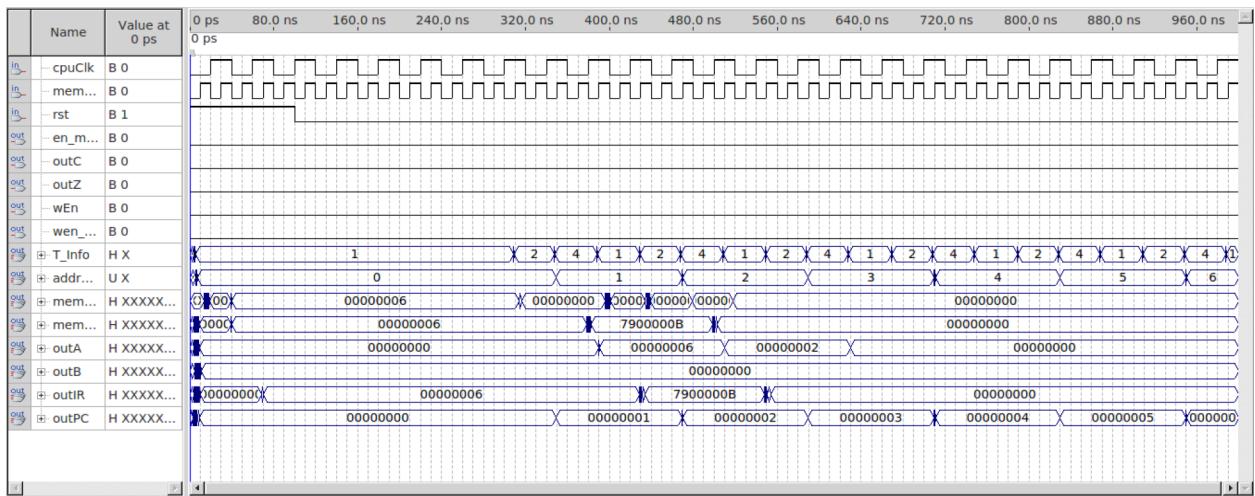


Figure 12: Time-sensitive ANDI waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	00000006	7100000B	00000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 13: mif File Settings for ADDI waveform

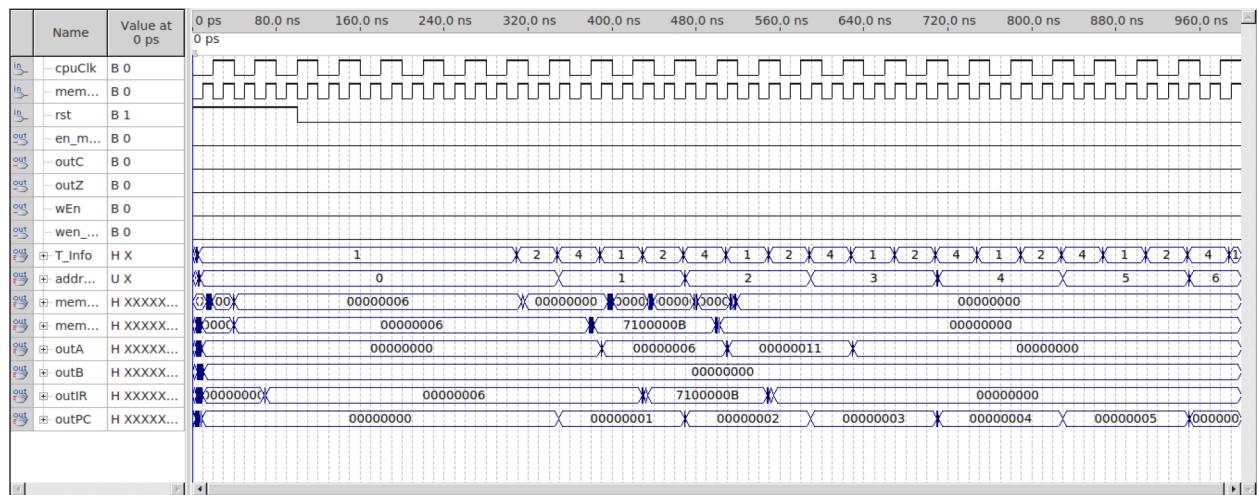


Figure 14: Time-sensitive ADDI waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	00000006	7D00000B	00000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 15: mif File Settings for ORI waveform

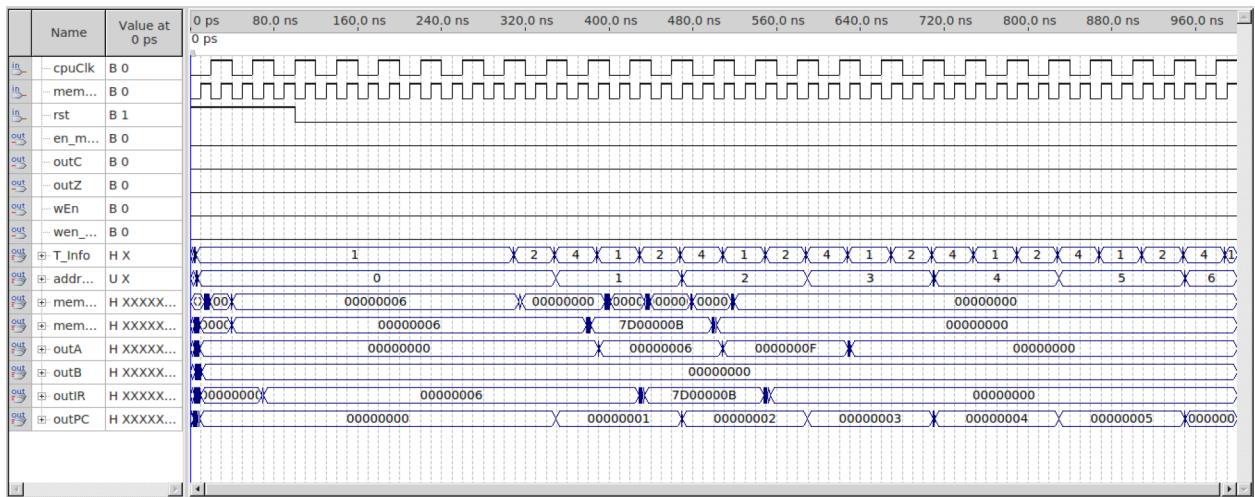


Figure 16: Time-sensitive ORI waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	00000005	10000003	70000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 17: mif File Settings for ADD waveform

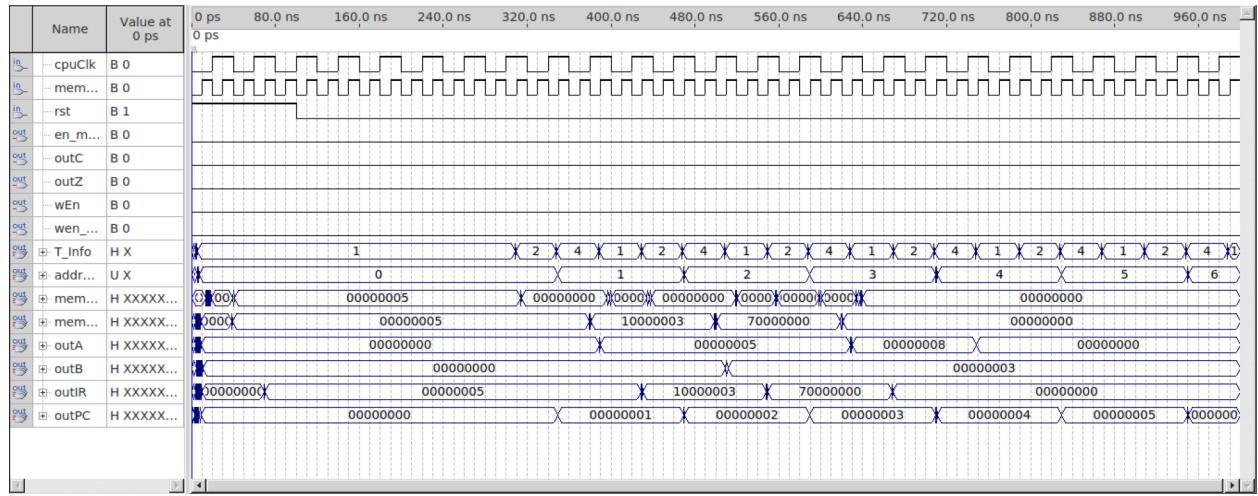


Figure 18: Time-sensitive ADD waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	00000005	10000003	72000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 19: mif File Settings for SUB waveform

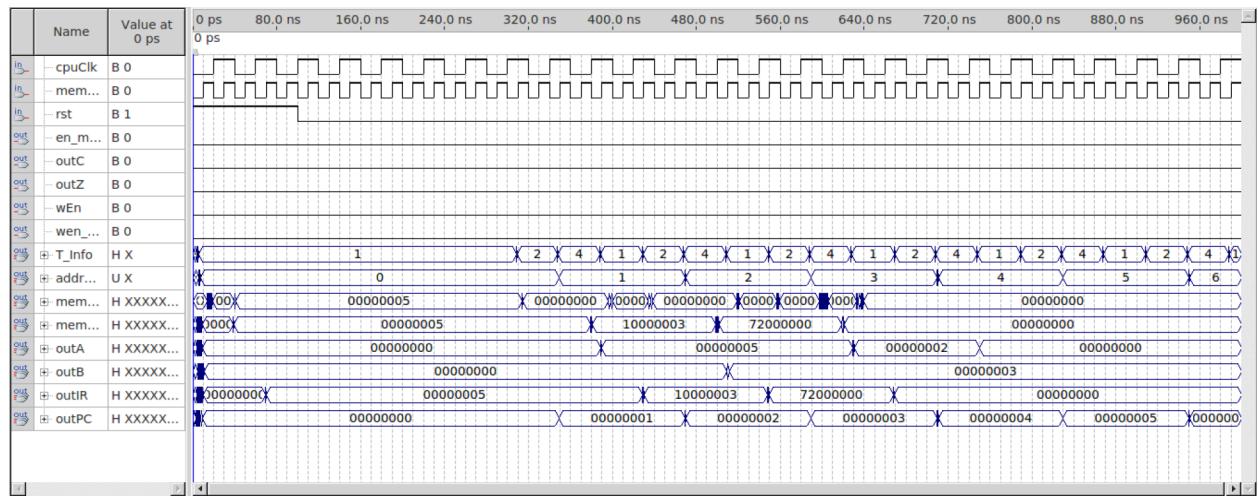


Figure 20: Time-sensitive SUB waveform

Figure 21: mif File Settings for DECA waveform

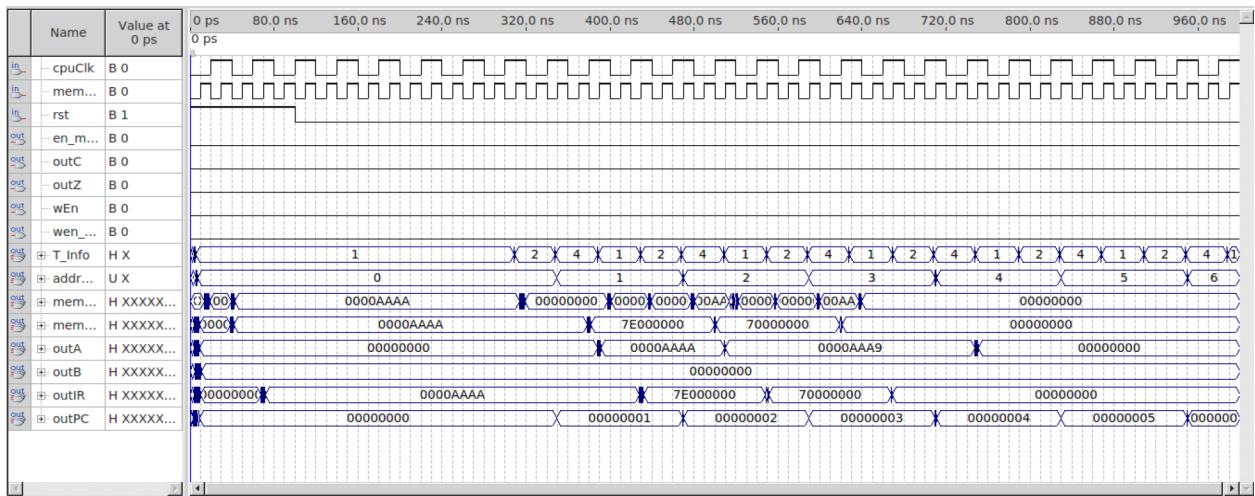


Figure 22: Time-sensitive DECA waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	0000AAAA	73000000	70000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 23: mif File Settings for INCA waveform

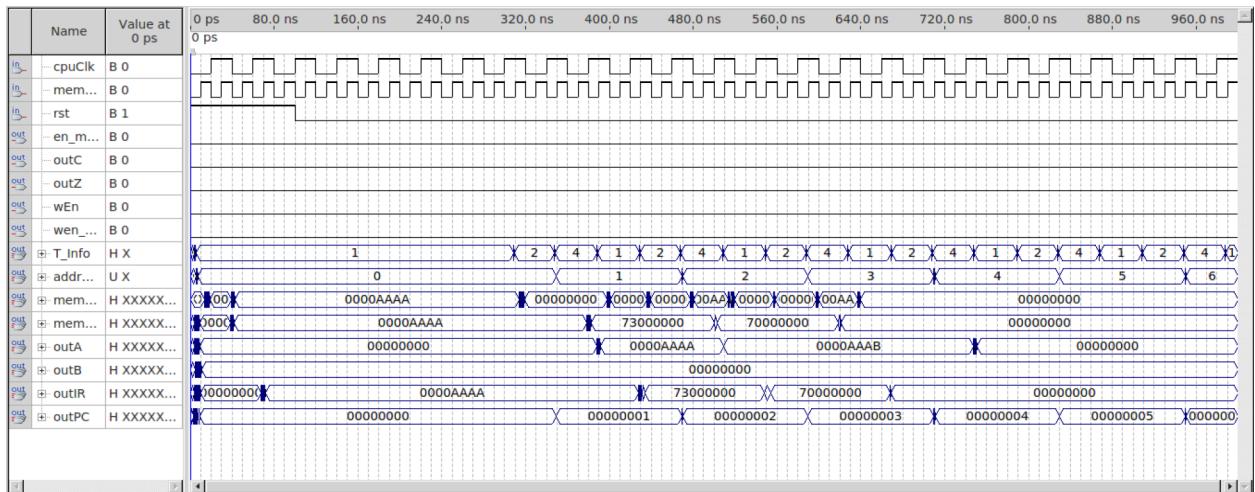


Figure 24: Time-sensitive INCA waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	00000008	74000000	70000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 25: mif File Settings for ROL waveform

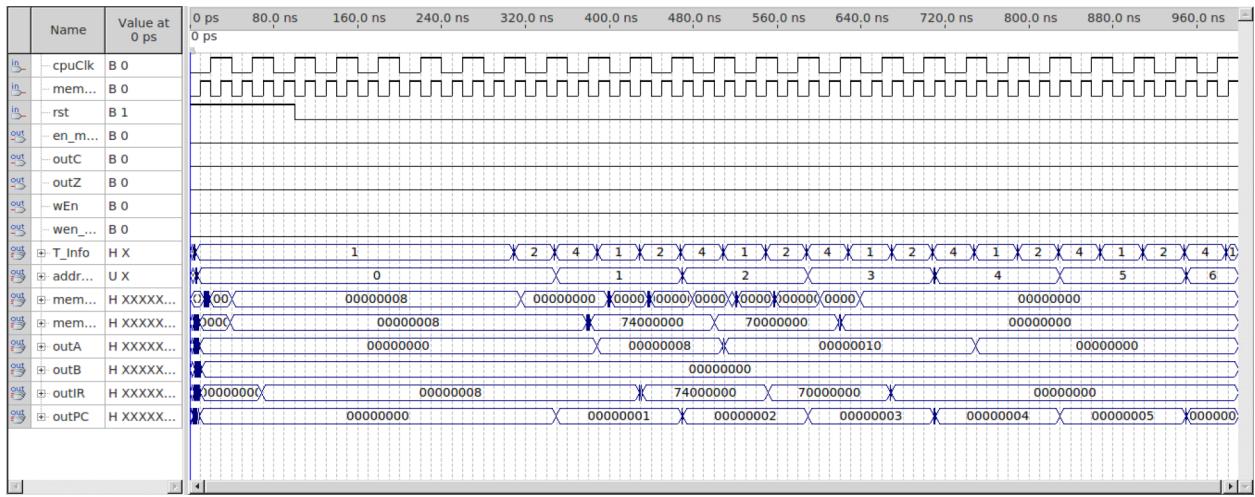


Figure 26: Time-sensitive ROL waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	00000008	7F000000	70000000	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 27: mif File Settings for ROR waveform

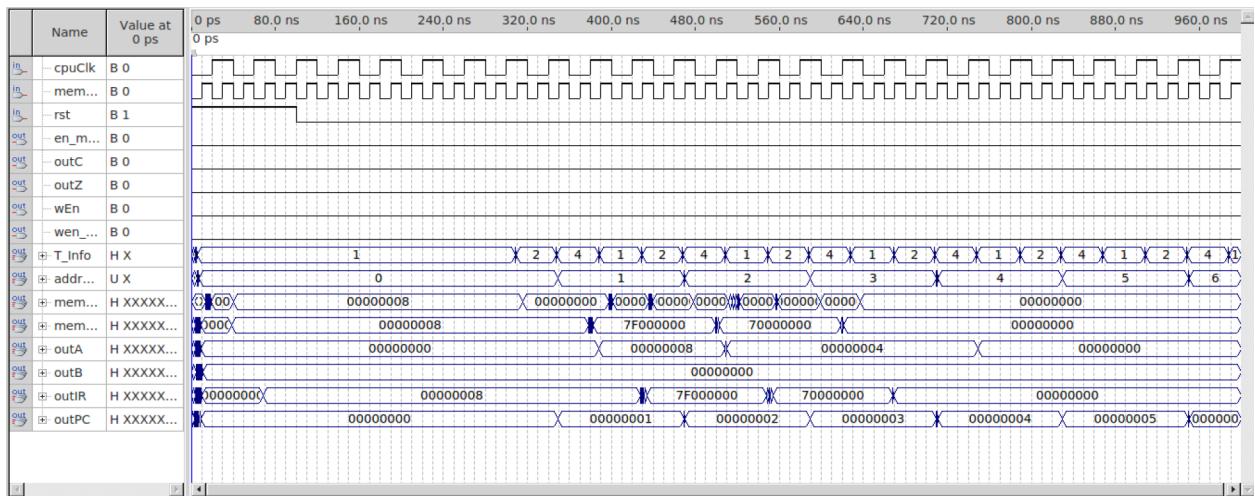


Figure 28: Time-sensitive ROR waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	0000AAAA	1000AAAA	600000F0	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 29: mif File Settings for BEQ waveform

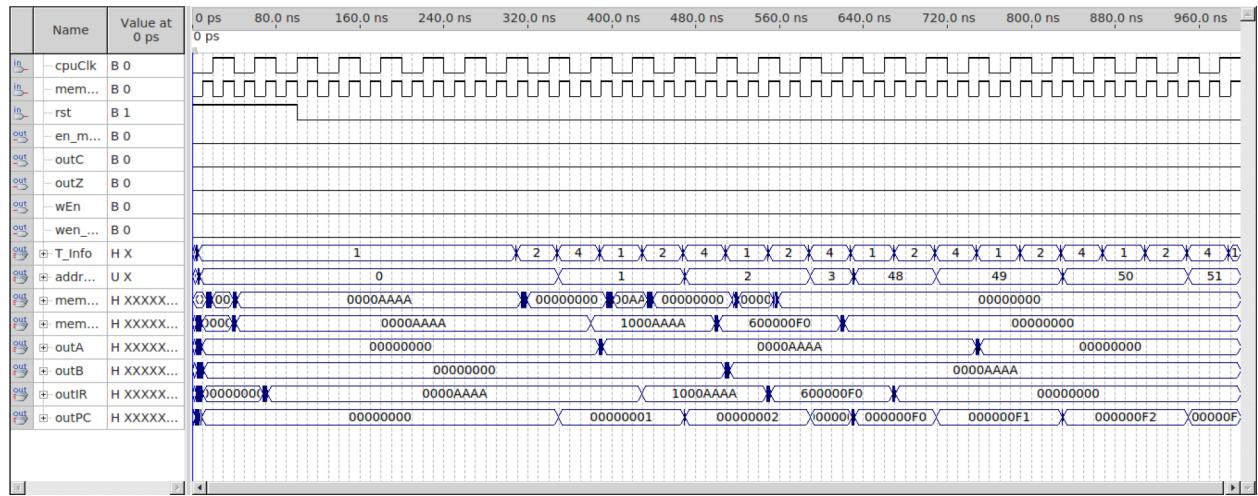


Figure 30: Time-sensitive BEQ waveform

Addr	+0	+1	+2	+3	+4	+5	+6	+7	ASCII
0	0000AAAA	1000BBBB	800000F0	00000000	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
16	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
24	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
32	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
40	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
48	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
56	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

Figure 31: mif File Settings for BNE waveform

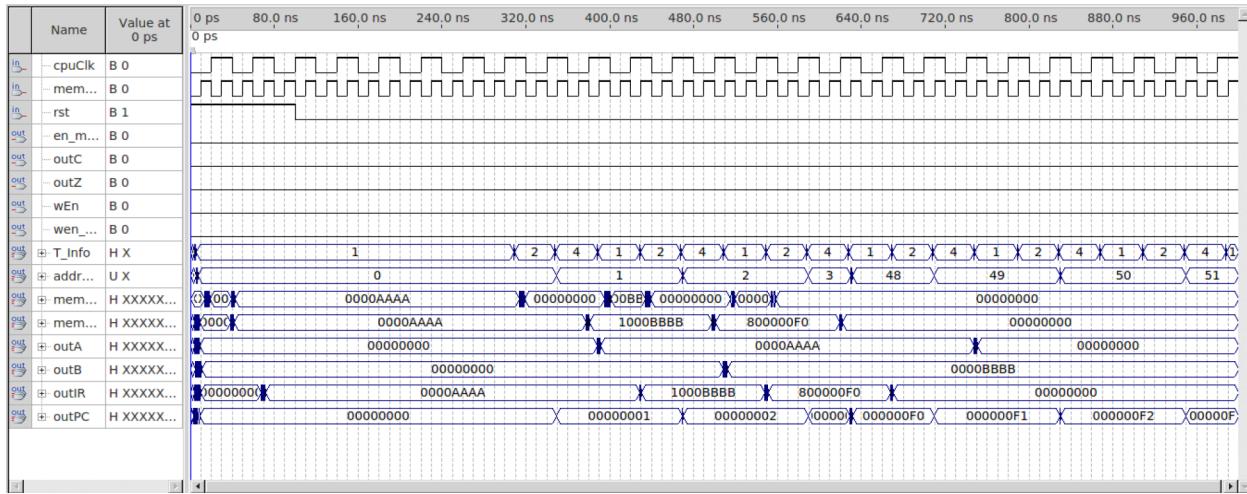


Figure 32: Time-sensitive BNE waveform

Conclusion

With the completion of this lab, the work of all the previous labs culminates to the successful emulation of a simple RISC-V cpu, marking the end of this project.

References

- [1] “Lab 6: The Complete CPU (Overall Project),” ee.torontomu.ca. Available:
<https://www.ee.torontomu.ca/~courses/coe608/labs/lab6.pdf>