

1. P1

(a) 256x8

(b) 512x5

2. P2

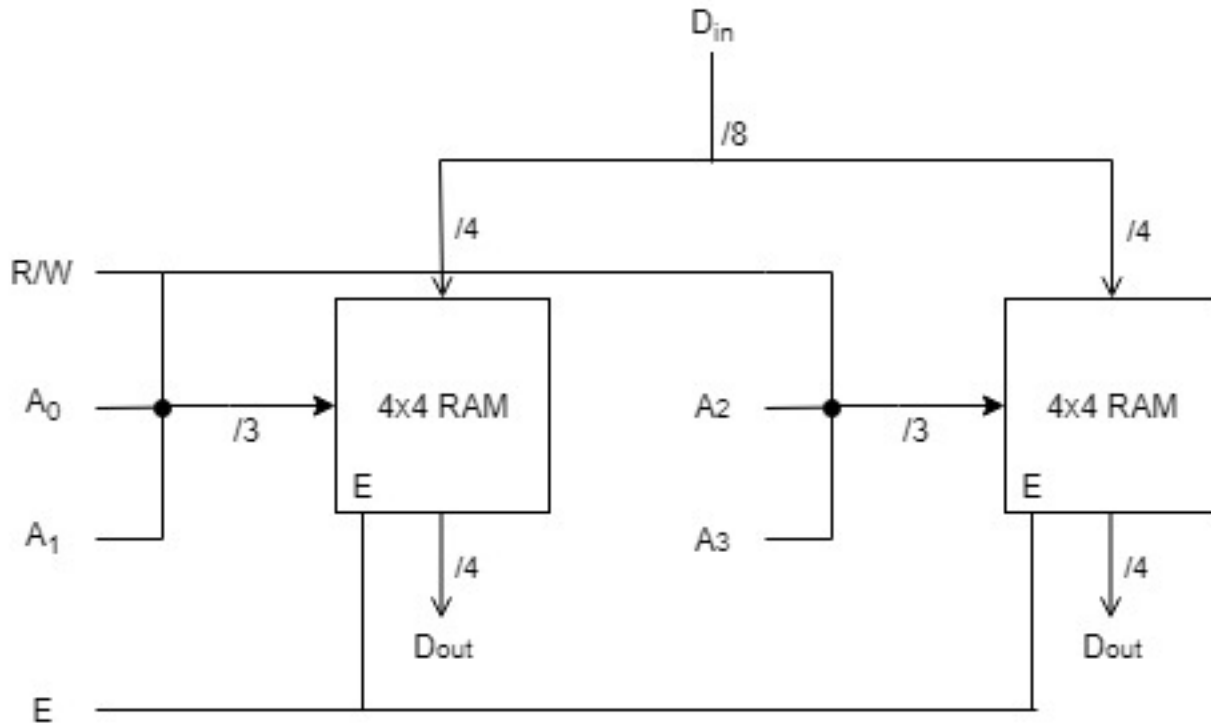


Figure 1: block diagram for the 8x8 memory

3. P3

(a)  $8M \times \frac{16}{8} = 16M$  bytes per chips, so  $\frac{64M}{16M} = 4$  such chips are needed

(b)  $\log_2(8M) + \log_2(4) = 25$  bits

(c)  $\log_2(8M) = 23$  bits since each chip has 8M rows of data

(d)  $2 \times 4$  since there are 4 chips to select from and  $\log_2(4) = 2$  bits can select 4

4. P4

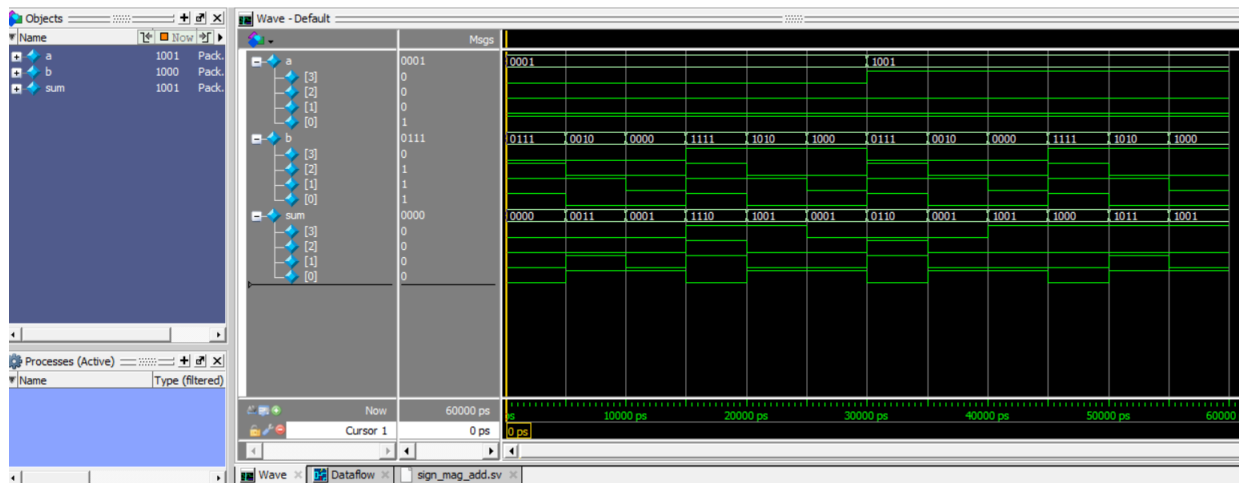


Figure 2: testbench for signed mag add

## 5. P5 PART1

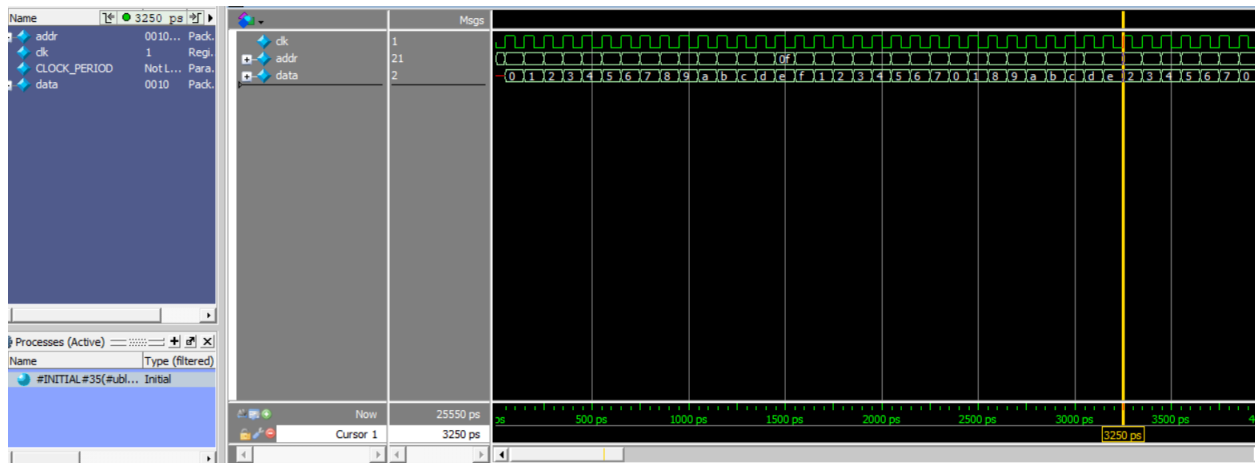



Figure 3: first line data of loading truthtable4 to the ROM

Analysis & Synthesis Resource Usage Summary		
 <<Filter>>		
	Resource	Usage
1	Estimate of Logic utilization (ALMs needed)	0
2		
3	▼ Combinational ALUT usage for logic	0
1	-- 7 input functions	0
2	-- 6 input functions	0
3	-- 5 input functions	0
4	-- 4 input functions	0
5	-- <=3 input functions	0
4		
5	Dedicated logic registers	0
6		
7	I/O pins	13
8	Total MLAB memory bits	0
9	Total block memory bits	1024
10		
11	Total DSP Blocks	0
12		
13	Maximum fan-out node	clk~input
14	Maximum fan-out	4
15	Total fan-out	53
16	Average fan-out	1.77

PART2



Analysis & Synthesis Resource Usage Summary		
<<Filter>>		
	Resource	Usage
1	Estimate of Logic utilization (ALMs needed)	5
2		
3	▼ Combinational ALUT usage for logic	9
1	-- 7 input functions	0
2	-- 6 input functions	1
3	-- 5 input functions	0
4	-- 4 input functions	3
5	-- <=3 input functions	5
4		
5	Dedicated logic registers	0
6		
7	I/O pins	12
8		
9	Total DSP Blocks	0
10		
11	Maximum fan-out node	always0~0
12	Maximum fan-out	4
13	Total fan-out	48
14	Average fan-out	1.45

(a) Compilation Report for 8-bit sign magnitude add

Analysis & Synthesis Resource Usage Summary		
<<Filter>>		
	Resource	Usage
1	Estimate of Logic utilization (ALMs needed)	0
2		
3	▼ Combinational ALUT usage for logic	0
1	-- 7 input functions	0
2	-- 6 input functions	0
3	-- 5 input functions	0
4	-- 4 input functions	0
5	-- <=3 input functions	0
4		
5	Dedicated logic registers	0
6		
7	I/O pins	17
8	Total MLAB memory bits	0
9	Total block memory bits	2048
10		
11	Total DSP Blocks	0
12		
13	Maximum fan-out node	clk~input
14	Maximum fan-out	8
15	Total fan-out	97
16	Average fan-out	2.31

(b) Compilation Report for loading truthtable8 to the ROM

## 6. Comments

I like this homework. I spent around 5 hours doing it. The major difficulty lies in understanding question 5. The wording is kind of confusing and some information needed is not there, like where to check the compilation report. Could be better if it's clearer.