

Lab 4

ECN – 252

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Lesson 1 #sets =1, #Blocks/set = 2 and Block size = 4

i) K = 1 , #Hits = 24, #Misses = 8

Instructions ?

```
for i = 0:2
  for j = 0:16
    ld i*32 + j*1
  end
end
```

Reset Step > >>

Load Instructions

Addr	Tag	Set Index	Block Offset
47	11	n/a	3
	0b0001011	n/a	0b11

Cache ?

Set 0

10 11

Cache Configuration ? # Hits # Misses

Custom 24 8

Block Size (B) # Sets # Blocks/Set

4 1 2

Memory (512 B) ?

0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
84
88
92
96
100
104
108
112
116
120
124

ii) K = 2 , #Hits = 16 , #Misses = 16

Instructions ?

```
for i = 0:2
  for j = 0:16
    ld i*32 + j*2
  end
end
```

Reset Step > >>

Load Instructions

Addr	Tag	Set Index	Block Offset
62	15	n/a	2
	0b0001111	n/a	0b10

Cache ?

Set 0

14 15

Cache Configuration ? # Hits # Misses

Custom 16 16

Block Size (B) # Sets # Blocks/Set

4 1 2

Memory (512 B) ?

0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
84
88
92
96
100
104
108
112
116
120
124

iii) $K = 4$, #Hits = 0 , #Misses = 32

Instructions ?

```
for i = 0:2
for j = 0:16
ld i*32 + j*4
end
end
```

Reset
Step >
>>

Load Instructions

Addr	Tag	Set Index	Block Offset
92	23	n/a	0
	0b0010111	n/a	0b00

Cache ?

Set 0

22 23

Cache Configuration ?

Custom

Hits

0

Misses

32

Block Size (B)

4

Sets

1

Blocks/Set

2

Memory (512 B) ?

0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
84
88
92
96
100
104
108
112
116
120
124

Lesson 2

iv) #Hits = 24 , #Misses = 8

Instructions ?

```
for i = 0:8
for j = 0:4
ld i*32 + j
end
end
```

Reset
Step >
>>

Load Instructions

Cache ?

Set 0

48 56

Cache Configuration ?

Custom

Hits

24

Misses

8

Block Size (B)

4

Sets

1

Blocks/Set

2

Memory (512 B) ?

0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
84
88
92
96
100
104
108
112
116
120
124

v) **#Hits = 0 , #Misses = 32**

Instructions ?

```
for j = 0:4
for i = 0:8
ld i*32 + j
end
end
```

Reset

Step >

>>

Load Instructions

Cache ?

Set 0

48

56

Cache Configuration ?

Hits

Misses

Custom

0

32

Block Size (B)

Sets

Blocks/Set

4

1

2

Memory (512 B) ?

0

4

8

12

16

20

24

28

32

36

40

44

48

52

56

60

64

68

72

76

80

84

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92

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124

Lesson 3

vi) **Both ld and st #Hits = 48, #Misses = 80**

Instructions ?

```
for j = 0:8
for i = 0:8
ld i*32 + j
st j*32 +i +200
end
end
```

Reset

Step >

>>

Load Instructions

Cache ?

Set 0

57

107

Cache Configuration ?

Hits

Misses

Custom

48

80

Block Size (B)

Sets

Blocks/Set

4

1

2

Memory (512 B) ?

0

4

8

12

16

20

24

28

32

36

40

44

48

52

56

60

64

68

72

76

80

84

88

92

96

100

104

108

112

116

120

124

Only ld instruction - #Hits = 0, #Misses = 64

Instructions ?

```
for j = 0:8
for i = 0:8
ld i*32 + j
end
end
```

Reset

Step >

>>

Load Instructions

Cache ?

Set 0

49

57

Cache Configuration ?

Hits

Misses

Custom

0

64

Block Size (B)

Sets

Blocks/Set

4

1

2

Memory (512 B) ?

0

4

8

12

16

20

24

28

32

36

40

44

48

52

56

60

64

68

72

76

80

84

88

92

96

100

104

108

112

116

120

124

Only st instruction - # Hits = 48, #Misses = 16

Instructions ?

```
for j = 0:8
for i = 0:8
st j*32 + i +200
end
end
```

Reset

Step >

>>

Load Instructions

Cache ?

Set 0

106

107

Cache Configuration ?

Hits

Misses

Custom

48

16

Block Size (B)

Sets

Blocks/Set

4

1

2

Memory (512 B) ?

0

4

8

12

16

20

24

28

32

36

40

44

48

52

56

60

64

68

72

76

80

84

88

92

96

100

104

108

112

116

120

124

vii) Both ld and st #Hits = 48, #Misses = 80

Instructions ?

```
for i = 0:8
for j = 0:8
ld i*32 + j
st j*32 + i + 200
end
end
```

Reset Step > >>

Load Instructions

Cache ?

Set 0

57 107

Cache Configuration ?

Custom

Hits

48

Misses

80

Block Size (B)

4

Sets

1

Blocks/Set

2

Memory (512 B) ?

0	
4	
8	
12	
16	
20	
24	
28	
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120	
124	

Only ld instruction - #Hits = 48, #Misses = 16

Instructions ?

```
for i = 0:8
for j = 0:8
ld i*32 + j
end
end
```

Reset Step > >>

Load Instructions

Cache ?

Set 0

56 57

Cache Configuration ?

Custom

Hits

48

Misses

16

Block Size (B)

4

Sets

1

Blocks/Set

2

Memory (512 B) ?

0	
4	
8	
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16	
20	
24	
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112	
116	
120	
124	

Only st instruction - #Hits = 0, #Misses = 64

Instructions ?

```
for i = 0:8
for j = 0:8
st j*32 + i + 200
end
end
```

Reset Step > >>

Load Instructions

Cache ?

Set 0

99 107

Cache Configuration ?

Custom

Hits

0

Misses

64

Block Size (B)

4

Sets

1

Blocks/Set

2

Memory (512 B) ?

0	
4	
8	
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16	
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Lesson 4

viii) Enrollment No. – 19114001

Decimal No. – 19114001.34567

Binary No. – 01001011100100011101010000001001

Binary Number	Decimal	Diff
01001011100100011101010000001001	19114001.34567	0
01001011100100011101010000000000	19113984.0	17.34567
01001011100100011101010000000000	19113984.0	17.34567
01001011100100011101000000000000	19111936.0	2,065.34567
01001011100100010000000000000000	19005440.0	1,08,561.34567
01001011100100000000000000000000	18874368.0	2,39,633.34567
01001011000000000000000000000000	8388608.0	1,07,25,393.34567

Lesson 5

ix) Binary No. – 01001011100100011101010000001001

Error in Bit	Binary Number	Decimal	Diff
No error	01001011100100011101010000001001	19114001.34567	0
1	00001011100100011101010000001001	5.61710034315e-32	≈-1,91,14,001.34567
2	01101011100100011101010000001001	3.52591103118e+26	≈3.52591103118e+26
3	01011011100100011101010000001001	8.20940134857e+16	≈8.20940134666e+16
4	01000011100100011101010000001001	291.656524658	-1,91,13,709.689145342
5	01001111100100011101010000001001	4893184512.0	4,87,40,70,510.65433
6	01001001100100011101010000001001	1194625.125	-1,79,19,376.22067
7	01001010100100011101010000001001	4778500.5	-1,43,35,500.84567
8	01001011000100011101010000001001	9557001.0	-95,57,000.34567
9	01001011110100011101010000001001	27502610.0	83,88,608.65433

Lesson 6

x)

Memory	Write Latency (ns)	Leakage Power (mW)
SRAM	0.870329ns	82.2568mW
eDRAM	0.426995ns	12.0617mW
STTRAM	4.69172ns	37.3457mW
ReRAM	8.71368ns	101.578mW