Lab 4 ECN 252

(For any question, contact Dr Sparsh Mittal)

http://vhosts.eecs.umich.edu/370simulators/cache/simulator.html

Lesson 1: Seeing the impact of strided access

Consider code1:

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

Let #sets =1, #Blocks/set = 2 and Blocksize = 4.

Run this code with following K and report #Hit and #Miss for i, ii and iii.

(i) K=1

(ii) K=2

(iii) K=4

Lesson 2: Seeing the impact of loop interchange

Consider this code2

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

Consider this code3

```
for j = 0:4
  for i = 0:8
```

```
   ld i*32 + j
  end
end
```

(iv) Report #Hit and #Miss with code2

(v) Report #Hit and #Miss with code3

Lesson 3: Seeing the miss-rate of matrix-tranpose operation

Code4

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

Code5

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

(vi) Find the total #Hit and #Miss for Code4. Also show them separately for ld and st instructions.

(vii) Find the total #Hit and #Miss for Code5. Also show them separately for ld and st instructions.

Lesson 4: Seeing the impact of approximation (precision-scaling)

https://www.h-schmidt.net/FloatConverter/IEEE754.html

Consider a sample binary number: 01000010111111111111111111111111

In place of this number, a student has to take the decimal number as **RollNumber.34567**. For example, a student with roll number 19114001 has to take the number as 19114001.34567 and then find its binary number: 01001011100100011101010000001001

(viii) Make a table

Binary number	Decimal	Diff
01000010111111111111111111111111	?	?
01000010111111111111111111110000	?	?
01000010111111111111111100000000	?	?
01000010111111111111000000000000	?	?
01000010111111110000000000000000	?	?
01000010111100000000000000000000	?	?
01000010100000000000000000000000	?	?

Diff is the difference of decimal number from the exact representation.

Lesson 5: Seeing the impact of error in bits of different importance

Consider a sample FP32 number 01001110111111111111111111111111

In place of this number, a student has to take the decimal number as **RollNumber.34567**. For example, a student with roll number 19114001 has to take the number as 19114001.34567 and then find its binary number: 01001011100100011101010000001001

Let us number the bits from MSB to LSB as 0 to 31.

Bit 0 is sign bit. Let error in bit position k mean that if its original value is 0, it changes to 1; and vice versa.

(ix) Make a table. Diff has to be shown as NewNumber-OriginalNumber. Do not compute its magnitude, rather show as +/-, e.g., +5 or -13456

Error in bit	Representation	DecimalNumber	diff
No error	01001110111111111111111111111111	?	0
1	0**0**001110111111111111111111111111		
2			
3			
4			

5

6

7

8

9

Lesson 6: Seeing the impact of memory technology on important metrics

(x) Run destiny with four cfg files and show the write latency and leakage power in the table

https://drive.google.com/drive/folders/1-dTiC0Q6jq6rvX5KBXeb3q3Rl0huBPlp?usp=sharing

git clone https://bitbucket.org/sparsh_mittal/destiny_v2/

cd destiny_v2

make

cd config

../destiny Final_ReRAM.cfg

Memory	WriteLatency (ns)	LeakagePower (mw)
SRAM		
eDRAM		
STTRAM		
ReRAM		