

ECEN 5623

Homework set 4

Due as indicated on Canvas

These problems should be done individually, not with your project partner.

1. Develop an example of a 32-bit Hamming encoded word (39 bits total) and show a **correctable** SBE scenario. Show the data word in a table like Figure 5.6 in the book.
2. For the foregoing problem, now show an **uncorrectable** MBE scenario.
3. For the following Nand flash block update history for 2 sectors that contain 4 blocks each (e.g. 16K sectors, with 4K blocks), fill in the missing WRITE operations as needed and compute write-amplification.

	#1 - Start	#2	#3	#4	#5	#6	#7
	↓	↓	↓	↓	↓	↓	↓
Sector Erased (S0, S1)	0,0	1,1	1,1	1,1	1,1	2,1	2,1
S1							
PB7	FREE	FREE	FREE	LB3	LB3	LB3	LB3
PB6	FREE	FREE	LB2	LB2	INVLD	INVLD	INVLD
PB5	FREE	LB3	LB3	INVLD	INVLD	INVLD	INVLD
PB4	FREE	LB2	INVLD	INVLD	INVLD	INVLD	INVLD
S0							
PB3	FREE	FREE	FREE	LB1	LB1	FREE	LB1
PB2	FREE	FREE	LB0	LB0	INVLD	FREE	FREE
PB1	FREE	LB1	LB1	INVLD	INVLD	FREE	LB2
PB0	FREE	LB0	INVLD	INVLD	INVLD	FREE	LB0
FS LBs Updated		0,1,2,3	0,2	1,3	0,2	0,2	0,2
FS LBs Cached					0,2	0,2	
Sector LBs Buffered						1	
	#8	#9	#10	#11	#12	#13	#14
Sectors Erased (S0, S1)	2,1	2,1	2,2	2,2	2,2	3,2	3,2
S1							
LB3	INVLD	FREE	FREE	LB2	LB2	LB2	LB2
INVLD	INVLD	FREE	FREE	LB0	LB0	LB0	LB0
INVLD	INVLD	FREE	LB3	LB3	INVLD	INVLD	INVLD
INVLD	INVLD	FREE	LB1	LB1	INVLD	INVLD	INVLD
S0							
LB1	INVLD	INVLD	INVLD	INVLD	INVLD	FREE	FREE
FREE	FREE	FREE	FREE	FREE	FREE	FREE	FREE
LB2	LB2	LB2	LB2	INVLD	INVLD	FREE	LB3
LB0	LB0	LB0	LB0	INVLD	INVLD	FREE	LB1
FS LBs Updated	0,2	1,3	1,3	1,3	0,2	1,3	1,3
FS LBs Cached		1,3	1,3			1,3	1,3
Sector LBs Buffered							

#1 - All blocks FREE

#2 - Erase S0 & S1, WRITE _____

#3 - Read LB 0, 2, Modify, WRITE _____

#4 - Read LB 1, 3, Modify, WRITE _____

#5 - Read LB 0, 2, Modify and Cache

#6 - Buffer LB 0, 1, 2, Erase S0

#7 - WRITE _____ to S0

Write Amplification = _____

#8 - Read LB 1, 3, Modify and Cache

#9 - Erase S1

#10 - WRITE _____

#11 - Read LB 0, 2, Modify, WRITE _____

#12 - Read LB 1, 3, Modify and Cache

#13 - Erase S0

#14 - WRITE _____

Write Amplification = _____

Total sector erases for both S0 and S1 = _____