Quiz (Lecture 4)  

Your name: 

Q1: Indicate if each of the following statements is true (T) or false (F) 

<table>
<thead>
<tr>
<th>Statement</th>
<th>T</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory bank interleaving is most effective when the cache block size = 1</td>
<td></td>
<td></td>
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<tr>
<td>Using write buffers decreases the cache miss penalty in write-back caches</td>
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<tr>
<td>Mean time to failure is a measure of system reliability</td>
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<tr>
<td>The miss penalty increases linearly with the cache block size</td>
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</table>

Q2: complete the following sentences: 

The Hamming distance between the two binary strings 10101010 and 11101110 is 2.

Using the “even parity code”, the data word 110011 is encoded as 1100110.

In order to correct a single error and detect any two errors, the minimum distance between any two code words should be 4.

Q3: Given two very large arrays x[] and y[] of size n (cannot fit in the cache), and assuming that the cache block size is 4 words and consider the following computation: 

```c
for (i=0 ; i < n; i=i+2)
    z[i] = x[i] * y[i] ;
for (i=1 ; i < n; i=i+2)
    w[i] =  x[i] + y[i]  ;
```

a) What is the cache miss rate when executing the above code?

50% since a block that is brought to cache on a miss during iteration i in each loop will contain the data needed during iteration i+2, resulting in a hit.

b) Rewrite the above code to reduce the miss rate? 

```c
for (i=0 ; i < n; i=i+2)
    z[i] = x[i] * y[i] ;
    w[i+1] =  x[i+1] + y[i+1]  ;
```

c) What is the miss rate in the code that you provided in b? 

25% for the elements of arrays x and y since the elements of the arrays are accesses sequentially. 
50% for the elements of arrays z and w.