CSE140 Homework #8

You must SHOW ALL STEPS for obtaining the solution. Reporting the correct answer, without showing the work performed at each step will result in getting 0 points for that problem.

1. RTL Design:
   Exercise 5.10 from Vahid's book

2. Memory:
   Exercise 5.11 from Vahid's book

3. RTL Design:
   Exercise 5.18 from Vahid's book

4. RTL Design:
   Convert the following C code, which calculates the numbers of values that are not equal to \(b\) are within an array \(A\) consisting of 128 8-bit values, into a high-level state machine.

   ```c
   Inputs: byte a[128], byte b, bit go
   Outputs: byte freq, bit done
   Frequency:
   while(1) {
       while(!go);
       done=0;
       i=0;
       freq=0;
       while(i<128) {
           if(a[i]!=b) freq=freq+1;
           i=i+1;
       }
       done=1;
   }
   ```

5. ALU Design:
   Design a 4-bit ALU with the following functional table:

<table>
<thead>
<tr>
<th>M1</th>
<th>M0</th>
<th>Function Name</th>
<th>F(A,B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>A+B multiplied by 2</td>
<td>2*(A+B)</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Increment A</td>
<td>A+1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Subtract B from A</td>
<td>A-B</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>If (A == B) output A, otherwise output B</td>
<td>If (A==B) then A, else B</td>
</tr>
</tbody>
</table>

   A and B are two 4-bit binary numbers.
   M1, M0 are the control inputs for the Arithmetic Unit.
   Use a minimum number of Full Adders, Comparators, and Multiplexers.