1. [8 points] Suppose we have 8-bit signed numbers. Fill-in the following table:

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Binary</th>
<th>Hexadecimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>-7</td>
<td>11110001</td>
<td>0x8F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0x1B</td>
</tr>
</tbody>
</table>

2. Suppose $A = 0xFE$ and $B = 0xB8$
   a) [2 points] Translate $A$ and $B$ to binary
      
      $A =$  
      $B =$  
   
   b) [2 points] Assume $A$ and $B$ are signed numbers. Perform $(A + B)$ using the binary numbers you calculate in a) above.
      
      $A: +$  
      $B: $
c) [2 points] Did we get an overflow in the operation in number b) above?  
   Justify

d) [2 points] Now, assume A and B are unsigned numbers. Do the operation, in 
   binary, or $A + B$

   \[
   \begin{array}{c}
   A: \\
   + \\
   B: \\
   \end{array}
   \]

   _______________

   e) [2 points] Did we get an overflow from the results calculated in d) above?  
   Justify
3. Suppose we have the following logic circuit:

![Logic Circuit Image]

a) [5 points] Draw the truth table:

b) [2 points] Write the Boolean equation of the circuit: twice: one from the truth table and once from the circuit directly.

c) [3 points] Implement the above circuit using only a decoder (as a black box) and one gate.
d) [1 point] What do you think is the advantage of implementing a circuit using a decoder instead of just a group of logic gates? State only one reason.

4. [4 points] Suppose you have the decimal number -7.5
Write this number in IEEE floating point format, showing all the steps to get full credit.
5. Given the following datapath

a) [3 points] Write the microinstructions needed to do the fetch phase, and simplify as much as you can.

b) [3 points] Write three microinstructions (not assembly instructions) that can be executed in parallel.

c) [1 point] There is one arrow in the above diagram, if removed, the datapath will still work correctly for any assembly instruction (i.e. there is a useless arrow). Circle this arrow in the datapath.