Solutions - Quiz 2
(February 10th @ 5:30 pm)

PROBLEM 1 (30 pts)
- Complete the following table. Use the fewest number of bits in each case:

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Sign-and-magnitude</th>
<th>1's complement</th>
<th>2's complement</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30</td>
<td>111110</td>
<td>100001</td>
<td>100010</td>
</tr>
<tr>
<td>-16</td>
<td>110000</td>
<td>101111</td>
<td>1000</td>
</tr>
<tr>
<td>-17</td>
<td>110001</td>
<td>101110</td>
<td>101111</td>
</tr>
<tr>
<td>-9</td>
<td>11001</td>
<td>10110</td>
<td>10111</td>
</tr>
</tbody>
</table>

- Convert the following decimal number to its 2's complement representation: -30.375
  30.375 = 011110.011₂ → -30.375 = 100001.101₂

PROBLEM 2 (30 pts)
- Implement the following function using ONLY 2-to-1 MUXs:
  \[ f(x, y, z) = xy + yz + xz \]

\[
 f(x, y, z) = \bar{x}f(0, y, z) + xf(1, y, z) = \bar{x}(yz) + x(y + yz + z) = \bar{x}g(y, z) + xh(y, z) \\
 g(y, z) = \bar{y}g(0, z) + yg(1, z) = \bar{y}(0) + y(2) \\
 h(y, z) = \bar{y}h(0, z) + yh(1, z) = \bar{y}(z) + y(1)
\]

PROBLEM 3 (40 pts)
- Complete the timing diagram of the circuit shown below: