ITM1010 Assignment #1

Due time: 5:00pm on Thursday, 2 October 2003 to the tutor or me.

Q-1. Convert the following decimal numbers to their binary equivalents:
   a. 162_{(10)}  
   b. 2048_{(10)}  
   c. 32.125_{(10)}  

Q-2. Convert the following binary numbers to their decimal equivalents:
   a. 101010_{(2)}  
   b. 11011011_{(2)}  
   c. 11101.11_{(2)}  

Q-3. Convert the following decimal numbers to their hexadecimal equivalents:
   a. 426_{(10)}  
   b. 5000_{(10)}  
   c. 65535_{(10)}  

Q-4. Write the following decimal numbers to 3-digit hexadecimal numbers using
the 2s complement representation of negative numbers (without sign bit).
   a. –1800_{(10)}  
   b. –3022_{(10)}  

Q-5. Subtract the following binary numbers using 2s complement. Show your
work in steps.
   a. 1010_{(2)} – 1100_{(2)}  
   b. 1010_{(2)} – 0100_{(2)}  

Q-6. State the purposes of Gray code, BCD code and ASCII code.

Q-7. Draw the standard logic symbol for a 2-input (a) AND gate, (b) OR gate, (c)
NAND gate, (d) NOR gate, and (e) XOR gate.

Q-8. Fill in the following truth tables:

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Q-9. Complete the following:
   a. A(B+C) =  
   b. A + AB =  
   c. A + \overline{AB} =  
   d. \overline{A + B} =  
Q-10. Simplify the following expressions using Boolean algebra:

a. \( \overline{ABC} + \overline{ABC} \)

b. \( \overline{ABC} + \overline{ABC} + \overline{ABC} + \overline{ABC} \)

c. \( \overline{ABC} + \overline{A} + C \)

d. \( X \overline{Y} \overline{Z} \)

Q-11. Plot the high output from the truth table on a K-map and simplify the resultant expression.

\[
\begin{array}{cccc|c}
A & B & C & F \\
0 & 0 & 0 & 1 \\
0 & 0 & 1 & 0 \\
0 & 1 & 0 & 0 \\
0 & 1 & 1 & 0 \\
1 & 0 & 0 & 1 \\
1 & 0 & 1 & 1 \\
1 & 1 & 0 & 0 \\
1 & 1 & 1 & 0 \\
\end{array}
\]

X: Don’t care

\[
\begin{array}{cccc|c}
A & B & C & D & F \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 1 \\
0 & 1 & 0 & 0 & 0 \\
0 & 1 & 1 & 1 & 1 \\
1 & 0 & 0 & 0 & 0 \\
1 & 0 & 1 & 1 & 1 \\
1 & 1 & 0 & 0 & 0 \\
1 & 1 & 1 & 1 & 0 \\
\end{array}
\]

Q-12. Design a 3-input circuit that will output low only on input counts of 1 (i.e. when \( A = 0, B = 0, \) and \( C = 1 \)) and 3 (when \( A = 0, B = 1, \) and \( C = 1 \)). Implement the circuit with the fewest logic gates. Label the standard gates in your circuit drawing.

Q-13. Which input of the active-low latch must be activated to put the latch in the SET state?

Q-14. What logic levels must be applied to the inputs of the active-low latch to put it in the CLEAR state?

Q-15. What state of operation is the active-high latch in when both inputs are activated?