LAB Assignment #2 for CMPE 312L

Description: Implementing simple circuits in Circuit Maker.

Turn in the solutions for each problem with the necessary printouts.

Problem 1: Give the truth table for the following switching function

\[ f(A, B, C, D) = (\overline{B} + C\overline{D}) \cdot A + \overline{A}B\overline{C}D \]

List each individual term in the truth table. Connect the circuit in Circuit Maker. Turn in a printout of the circuit and the waveform showing all input states.

Problem 2: A logic circuit has four inputs A,B,C and D. Find the logic equations for the circuit if the output is to be high only when an odd number of the inputs are high. Use any basic gates you want. Connect the circuit, turn in the circuit printout and the waveform showing all input states.

Problem 3: Design a multiple output logic network whose input is a BCD digit and whose outputs are defined as follows:

- \( f_1 \): Detects input digits which are divisible by 4.
- \( f_2 \): Detects numbers greater than or equal to 3.
- \( f_3 \): Detects numbers less than 7.

Use K-maps to solve this problem. Connect the circuit and turn in a printout of the circuit. Give three waveform plots one for each output. All possible input states should be present in all the plots.

Problem 4: Use K-maps to find the following functions:

\[
\begin{align*}
 f_1 & = f_\alpha \cdot f_\beta \\
 f_2 & = f_\alpha + f_\beta \\
 f_3 & = \overline{f}_\alpha \cdot f_\beta \\
 f_4 & = f_\alpha \oplus f_\beta
\end{align*}
\]

where,

\[
\begin{align*}
 f_\alpha & = AD + B\overline{D} + \overline{A}B\overline{C} \\
 f_\beta & = \overline{A}B + \overline{B}D
\end{align*}
\]

Connect the circuits for each function, turn in the printouts and the waveforms.

Problem 5: Design a circuit with four inputs A,B,C and D. The output is high only when a majority of the inputs is high. Use only NOR gates in this design. Connect the circuit, turn in a printout of the circuit and the waveforms.

THE LABS ARE INDIVIDUAL EFFORTS. INSTANCES OF CHEATING WILL RESULT IN YOU FAILING THE COURSE.