ECE 301 Digital Electronics

Combinational Logic Circuit Design

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OBJECTIVE

To design and implement a circuit that detects all of the Fibonacci numbers between 0 and 15.

PREPARATION

1. Determine the number of inputs required for the logic circuit.
2. Construct a truth table for the corresponding logic function.
3. Derive the minimum SOP expression.
4. Draw the corresponding AND-OR circuit.

PROCEDURE

The Fibonacci Series is a sequence of integer values in which one Fibonacci number is equal to the sum of the two previous Fibonacci numbers. The series begins with the values 0 and 1, and all following values are determined as previously specified. An equation which defines each of the values in the Fibonacci Series (following 0 and 1) is given below:

$$F_n = F_{n-1} + F_{n-2}$$

The first seven Fibonacci numbers are given below:

0, 1, 1, 2, 3, 5, 8, …

Additional information about the Fibonacci Series can be found at
http://en.wikipedia.org/wiki/Fibonacci_number

You are to:

1. Draw a truth table for the desired behavior of the circuit.

2. Design a combinational circuit that outputs a logic 1 for all Fibonacci numbers when unsigned magnitude values between 0 and 15 are presented to the circuit and output a logic 0 if the input is not a Fibonacci number.

3. Draw the circuit diagram indicating all IC types and pin numbers

4. Build the circuit using the standard logic gates provided in your parts list.

5. Demonstrate the correctly operating circuit to the TA.