Cpr E 281 HW01

ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

Initial Stuff and Basics
Assigned Date: First Week
Finish by Sep. 3, 2025

Instructions

Complete the questions below to the best of your ability. Write your solutions by hand on white paper. Once you are finished, upload a scanned PDF (just one file) of your work to Canvas. **Also, please write the following on the first page: 1) your full name; 2) your student ID number; and 3) your lab section letter.**

Questions

P1. (10 points) Define the following terms in no more than 2 sentences each.

A. ASCII
B. Number System
C. XOR gate
D. Hexadecimal Number
E. Timing Diagram

P2. (10 points) Answer the following in 4-5 sentences.

A. Draw and explain the circuit for adding two 1-bit binary numbers?
B. What is a binary number?

P3. (10 points) Convert the following numbers to decimal:

A. 1010101_2
B. 1011_2
C. 321_8
D. $C3D_{16}$
E. $CAFE_{16}$

P4. (10 points) Convert the following numbers to binary:

A. 47
B. 641
C. 193
D. 625_8
E. $ACDC_{16}$

P5. (10 points) Decode the message.

Consider this array of bytes: [47_{16} $6F_{16}$ 20_{16} 43_{16} 79_{16} 63_{16} $6C_{16}$ $6F_{16}$ $6E_{16}$ 65_{16} 73_{16} 21_{16}].

A. Convert each byte of the array to a binary number (e.g $32_{16} = 00110010_2$).
B. Convert each binary number to an ASCII character (Refer to section 1.5.3 on pages 14 – 16 in the textbook). What does it spell?

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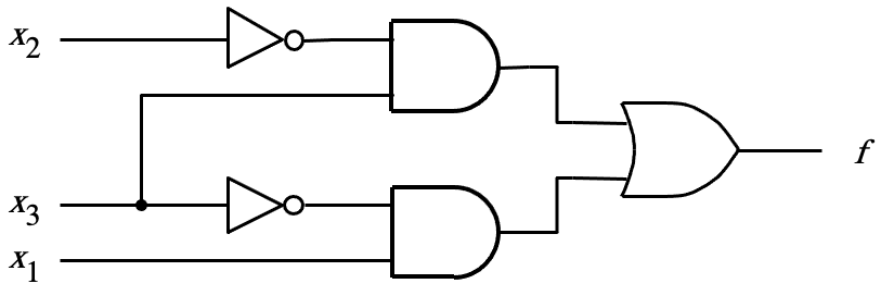
P6. (10 points) Consider the circuit below. Name the two inputs as A, and B. Name the output as F.

A. Write the logic expression for f.
B. Draw the truth table for the circuit.



P7. (20 points) Consider the logic function $f(x, y) = (\overline{x} + y) \cdot (x + \overline{y})$

A. (8 points) Draw the circuit diagram for $f(x, y)$.
B. (8 points) Write the truth table for $f(x, y)$.
C. (4 points) By looking at the truth table in (b), what observation can you make about $f(x, y)$.

P8. (20 points) Given the following logic expression:

$$F(x, y, z) = (x + \overline{y} + z) \cdot (x + y + \overline{z}) \cdot (\overline{x} + \overline{z})$$

A. (10 points) Draw the circuit diagram for $F(x, y, z)$.
B. (10 points) Draw the truth table for $F(x, y, z)$.