ECE2049: Homework 1

Material: Lecture 1
Due: Start of Lecture 3: Tuesday, 1 June 2021 by 2pm EDT

Submission notes:

- For full credit, please show your work and denote your answers with a circle or a box.
- Always write and draw your diagrams neatly! We cannot be expected to GUESS what you meant to write!
- Please see the submission guidelines on the homework page of the course website for details.

1. (5 pts) You are given three **16-bit** values shown below. Each of these values can be interpreted as:

- An unsigned number
- A sign-magnitude number
- A two's complement number

Provide the decimal (base 10) equivalent of each value for each of these interpretations. Show your work.

a. 0x2049
b. 0xCAFE
c. 0x408C

2. (5 pts) A hardware device is responsible for reading the state of 8 relays that control a manufacturing process. The device represents the state of each relay (R0—R7) in an 8-bit value v, with the state of relay R0 is stored in the least significant bit, and the state of R7 in the most significant bit.

If the device returns the value `v = 0x5B`, which relays are on?

3. (5 pts) Binary Coded Decimal (BCD) is an older, specialized format for storing numbers in which each decimal digit is encoded in 4 bits. Thus, the decimal number 1426 could be stored in BCD as 0x1426.

a. If a number is encoded in BCD as 0x526, what decimal value does it represent?

b. Speculate on one possible advantage and one disadvantage of using this format.