

ECE 3340 Numerical Methods

Homework 5: Numbers in Digital Systems

Name:

ID:

Problem 1: Signed Integers

What is the smallest value that can be represented by a 5-bit signed register using two's-complement?

Problem 2: Nintendo Entertainment System Memory

A Nintendo Entertainment System (NES) used a pixel processing unit (PPU) with 246 bytes of addressable sprite memory that could be used to process motion on the screen. How many bits were required to address this memory space?

Problem 3: NeoGeo Memory

The NeoGeo had 64 kilobytes (kB) of main VRAM. How many bits were required to address this memory space? There is a lot of confusion surrounding the ISO and JEDEC standards for the term *kilobyte*. Which do you think is used in this case?

Problem 4: Donkey Kong

The number of seconds given to complete each level L in the video game Donkey Kong is $s = \min(10L + 40, 80)$. Why has nobody gotten past level 22?

Problem 5: Floating Point

Convert the following 8-bit floating point values to decimal assuming the following format (with a bias of 7):

0001 0101 → sign exponent mantissa
0 0 0 1 0 1 0 1