ECE 3030: Physical Foundations of Computer Engineering
Fall 2022
Homework 11—Total points 100
Due on at 11.59pm. (No late submission/Strictly enforced.)

Q1 **DRAM Array:** Consider the DRAM array shown in figure 1. Say you want to read all the cells in row 2. What is the sequence of operation you will need to perform? Make sure that, after your prescribed operations, you keep the data in the cells you read intact. [Total 30 pts]

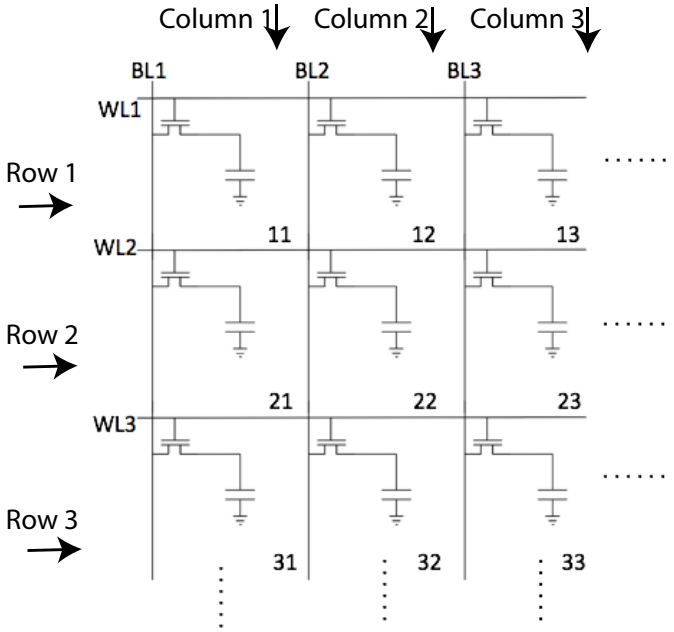

Figure 1: A DRAM array.

Q2 Explain in short why it necessary to have cache memories in today's microprocessor technology. [Total 30 pts]

Q3 Say you have deployed a bunch of IoT sensors to measure the distribution of temperature at different location in a forest which is then sent to a central server through internet telemetry. These sensors do not have any reliable source of power–*i.e.*, they do not have batteries; they harvest power from vibrations caused by the wind breeze, and the sensors may loose power at any moment. To store the temperature data, what kind of

memory will you use: SRAM, DRAM, FLASH or magnetic hard drive? Explain your answer. [Total 30 pts]

Q4 Compare and contrast the different memory technologies (SRAM, DRAM, Flash and magnetic disk) used in a memory hierarchy with respect to density, speed, and volatility [Total 10 pts]