ECE571: Advanced Microprocessor Design – Homework 9
Spring 2018

Due: Thursday 12 April 2018, 3:30pm

Create a document that contains the answers to the questions below. A .pdf or .txt file is preferred but I can accept MS Office or Libreoffice format if necessary.

1. Read the following article:

   - **A Validation of DRAM RAPL Power Measurements**
     by Desrochers, Paradis and Weaver
     `http://web.eece.maine.edu/~vweaver/projects/rapl/2016_memsys_rapl.pdf`
     (warning, it's a large 13MB download, large graphs)

   - Answer the following questions:

     (a) What kind of sensor was using for measuring actual DRAM power?
     (b) What tool was used to measure RAPL results?
     (c) Did the actual results match the DRAM results?
     (d) Why is it harder to measure DDR4 power than DDR3 power?
     (e) What additional experiments do you think could be run that would make this paper better?

2. Read the paper *Power Measurement Techniques on Standard Compute Nodes: A Quantitative Comparison* by Hackenberg, Ilsche, Schöne, Molka, Schmidt and Nagel (ISPASS 2013).
   `http://web.eece.maine.edu/~vweaver/classes/ece571_2014f/papers/ispass2013-power_measurement2.pdf`
   and answer the following questions:

     (a) What kind of power meter do they use to measure the DC power?
     (b) Is it possible to get exact power measurements from RAPL? Why or why not?
     (c) How long does it take to read a RAPL MSR?
     (d) Why were the 2P Sandybridge RAPL results better than the 1P Sandybridge RAPL results?
     (e) Why might high-resolution sampling not work when measuring the AC load? Were they able to find high-resolution results in the AC data anyway?
     (f) How did the AMD APM results compare to the RAPL results?

3. Submitting your work.

   - Create the document containing the answers to the questions asked.
   - Please make sure your name appears in the document.
   - e-mail the file to me by the homework deadline.