Bonus practice homework problems for Fall 2026

Q1. Say you have an FPGA where the Vcc to ground value is required to be in the range of 3.27 to 3.33V. Say that FPGA can draw up to 1.5A and that the voltage regulation module generates a solid 3.3V.

a. What is the maximum impedance your PDN (power distribution network) can have? **[3]**

b. Use the spreadsheet found on the course website with this assignment to generate a set of capacitors from those listed that will meet these requirements. You may assume you only need to worry about frequencies in the 10KHz to 900MHz range and you may include the PCB power/ground plane. Your solution should use as few capacitors as possible while meeting these requirements. **[12]**

Q2. Answer the following questions. Include a clear and concise explanation for each question.

a. Looking at figure 1 :

i. Which battery chemistry has the highest voltage per cell? **[2]**

ii. Which battery chemistry would likely be easiest to measure the remaining charge? **[2]**

iii. If each battery were nominally 10Ah, which "48V" battery would be best to use if you were feeding it into an LDO with an output of 48V? **[2]**

b. Looking at figure 2:

i. How it is the Peukert effect reflected in figure 2? **[2]**

ii. How long would you expect the battery to maintain at least 3.4V if there is a constant draw of 3A? 60A? **[4]**

Figure 1:

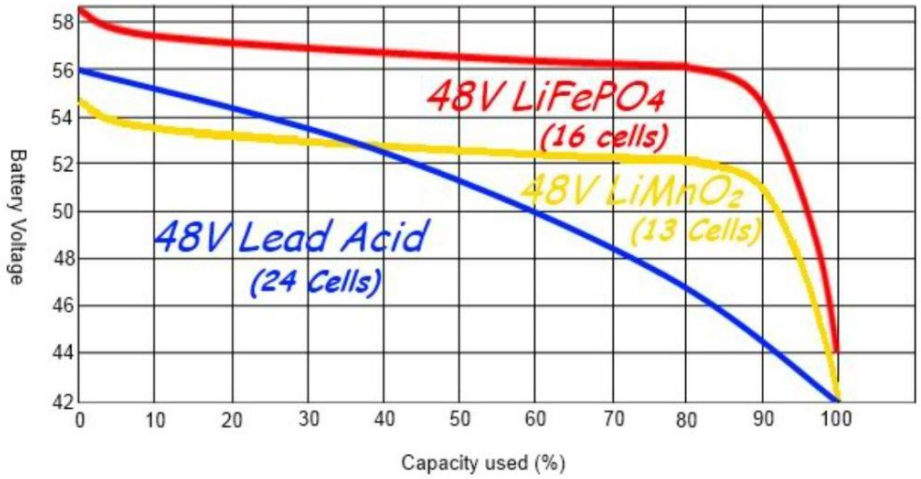


Figure 2:

