Contents

Pset3

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Problem 1

a)

$$e = \frac{V.n.q}{m}$$

$$e = \frac{1.72 \times 53.6 \times 3600}{0.1124/2 + 0.0917} = 2244024.34\ J/kg$$

b)

$$\text{Specific Energy} = \frac{V.n.q}{m}$$

$$\text{Specific Energy} = \frac{4.8 \times 0.7 \times 3600}{0.105} = 115200.0\ J/kg$$

$$\text{Energy Density} = \frac{V.n.q}{v}$$

$$\text{Energy Density} = \frac{4.8 \times 0.7 \times 3600}{0.056 \times 0.05 \times 0.0142} = 304225352.11\ J/m^3$$

The specific energy of the actual batter is lower probably because:

1. It probably does not use exactly $147.9g$ of material
2. The full weight of the battery used in the above calculation also probably includes the weight of the battery's casing which should really be subtracted because its not part of the active mass of the battery

Problem 2

i) ii)

An LFP battery that would be good for this task can be found here and its datasheet can be found here

iii)

This battery is $2.7kg$ lighter than the lead acid battery previously used, which is almost half the weight of the lead acid battery. Unfortunately its datasheet does not contain a Capacity Remaining vs DoD and # of Cycles characteristic curve, but the battery mentions that life cycle at 100% DoD is 2000 Cycles, which is much better than the 200 for the lead acid battery

iv)

Another factor to consider is the size of the battery.

This battery is 181 $mm \times 76$ $mm \times 165$ mm which is nearly the same size as the original lead acid battery. This means that the original casings built for the lead acid battery should be able to house the new battery with little to no modification.