Task 2: Heroic Hardware Challenges

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* Indicates required question

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Give a drive link to the all CADs or text files you want to upload for problem 1.1 and problem 2 (either upload all of them in a folder and share the folder **or** upload a zip fle and share the zip file)

https://drive.google.com/drive/folders/1c_4o8trDbcYPdDmre1gTPVZB_4hb6cmQ?usp=sharing

Give a drive link to 2-min max video running/explaining your work in problem 1.1

https://drive.google.com/file/d/19aYR01GlDVXb_2IZyha2g7blw3F2hKlz/view?usp=sharing

Give a drive link to 2-min max video running/explaining your work in problem 2

https://drive.google.com/file/d/1Vtz7ie9vceKOCG7rVvQ_ATCPAa-QYbxX/view?usp=sharing

Answer for problem 1.2

Assuming the power supply is a SMPS with high effiency and 5V output, the only power dissipated is through the current-limiting resistor and the LED
A red LED a forward voltage of 2.2V, therefore the current flowing in each LED (i = (Vs-Vled)/R) = (5-2.2)/330 = 8.5 mA.
So the power in each "branch" is (P = I^2*R + Vled*I) = (8.5e-3)^2*330 + 2.2*(8.5e-3) = 0.043W
With a power budget of 1440W, the highest number of LEDs connected in parallel is 1440/0.043 = 33,488 LEDs.

Answer for problem 3

Since all requried parts are 12 V, a 12V battery would be ideal for this application.
It should be able to continuously supply 16.5 Amps.
The required energy is = (4*12*4 + 12*0.5)W * (0.5)hr = 99 Whr.
A 12 V battery should be at least 99/12 = 8250 mAh
Proposed Solution:
A (Li-ion) battery pack using 12 18650 high drain (3.7V, 3350mAH,3C,10A max.,50g) batteries each 4 connceted in series and 3 branches in parallel. The final battery pack would have the following specs:
14.8V, 148.74 Whr, 30A max., weighs 600g and would cost 90*12=1080 EGP.

BONUS: Answer the questions that were proposed in Battery Basics session

Measuring Battery Capacity:
The battery should be fully charged and connected to a known load and have its power monitored continuously, either using a wattmeter or a combination of voltmeter and ammeter. The value of the energy delivered in each small time interval should calculated E = P*t, and the test should last till the battery's voltage is the minimum safe value.
The total capacity is then calculated as the sum Et = E1 + E2 + E3 + ...

BONUS: Use your understanding of power and energy concepts to calculate your electricity consumption and its cost. Can you reduce it?

(refer to Battery Basics session)

Your answer

What did help you solve the problem? *

- ○ Session
- ◉ Google Search
- ○ AI Tools
- ○ Friends
- ○ My Previous Knowledge
- ○ Other:

Rate how good the sessions were
(1: Not good, 5: Excellent)

	I didn't watch it.	1	2	3	4	5
Circuits Basics	○	○	○	○	◉	○
Electronics Basics	○	○	○	○	◉	○
Battery Basics	○	○	○	○	○	◉

Clear selection

Rate the task's difficulty *

1	2	3	4	5
○	○	○	◉	○

Rate your level of satisifaction *

1	2	3	4	5
○	○	○	○	◉

Any Comments

Your answer

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