



# ELECTRICAL TEAM TRAINING

## TASK 2

### Problem 1: Bat-Signal

#### About

The Bat-Signal is a crucial element in Gotham City's defense strategy, used by Commissioner Gordon to alert Batman of immediate threats and criminal activities. It projects a large, luminous bat symbol into the night sky, signaling Batman to take action. However, the current signal system is outdated and prone to failures. Your mission is to upgrade the Bat-Signal to ensure it operates efficiently and reliably, providing a bright and unmistakable call for help whenever Gotham is in danger.



#### Description

1. Design a circuit that takes 220V AC as input and the output is 5V DC and connects LED to the output and make a switching circuit to control this led (Hint: firstly, you need to step down the AC, then you need to convert AC to DC, and lastly connect the load).

# Task 2: Heroic Hardware Challenges

## Electrical Training 2024/25

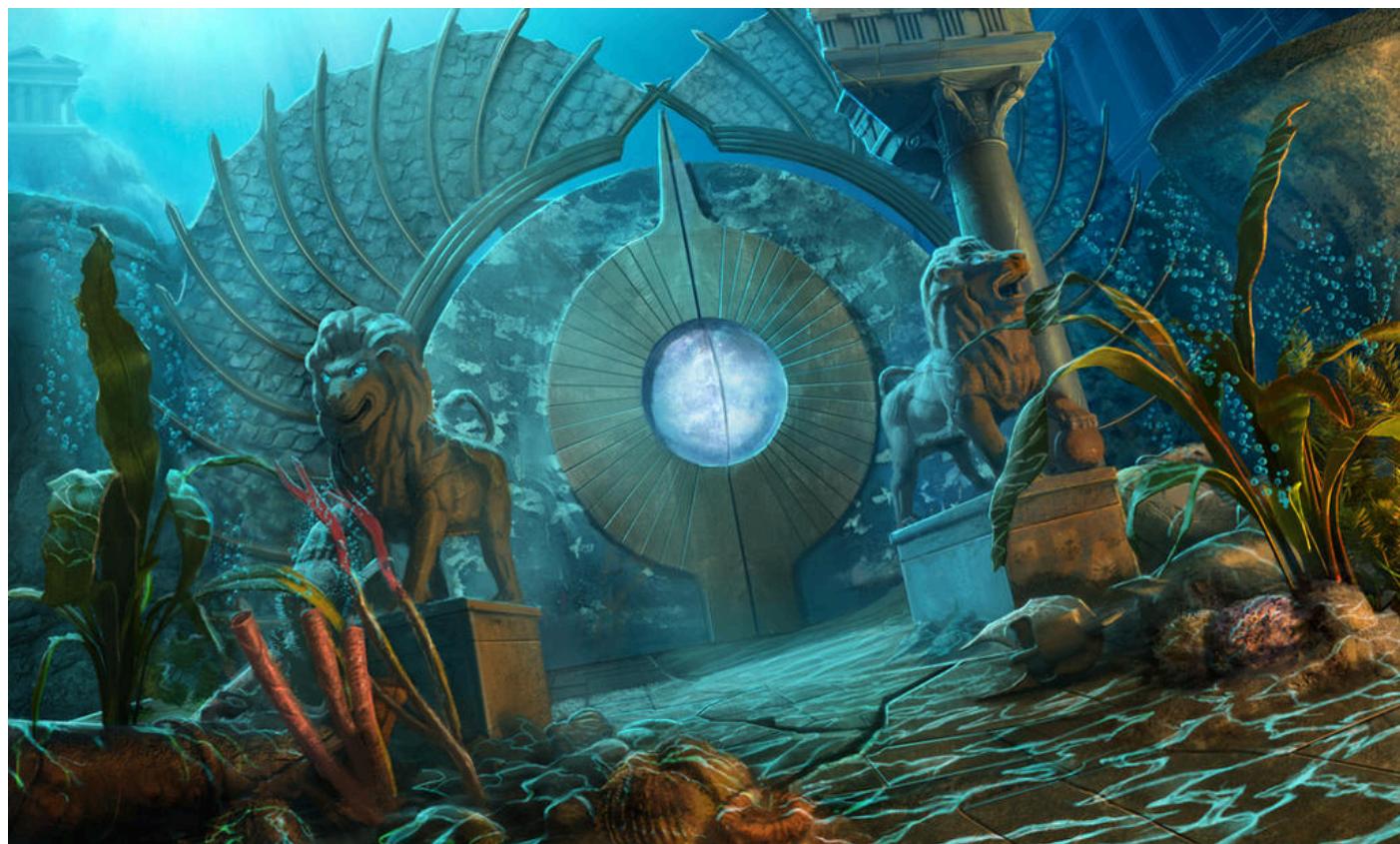


2. If the input power budget of your power supply is 1440W, and you use a current limiting resistor with each LED 330 ohm. Estimate how many LEDs could be put in parallel that is suitable for this power budget.(Npte: the LED will be burnt out after 100mA)

### Problem 2: Building Pyramids in Atlantis

#### About

Atlantis, the legendary underwater kingdom ruled by Aquaman, has numerous gates that control the flow of water and access to various areas within the kingdom. These gates are crucial for maintaining the security and stability of Atlantis. However, the current control systems are outdated and need an upgrade to ensure they function reliably under the harsh underwater conditions.



#### Description

Design a simple H-bridge driver to control the direction of the DC motor which opens and closes the gate using transistors (MOSFETs or BJTs).

### Problem 3: Cyborg's Battery Selection

#### About

Cyborg, a vital member of the Justice League, depends on advanced cybernetic enhancements powered by a sophisticated energy core. To enhance his performance and ensure sustained operation during intense missions, you need to design an optimal battery configuration that maximizes power output while minimizing weight and ensuring reliability.



#### Description

One of Cyborg's parts needs a power solution for four 12V motors, each drawing 4A continuously, and a camera drawing 0.5A at 12V. The system must operate for at least half an hour on a single charge. You may use more than one battery to meet this requirement, but aim to minimize weight, size, and cost.

Your task is to identify the most suitable battery by balancing cost, performance, weight, and size. Search for suitable batteries in both local (Egypt) and international online stores. Justify your choice and include a factor of safety in your calculations to ensure the system's reliability.

### **Batteries Session's Bonus Questions**

- Answer the questions that are proposed in the Battery Basics session in the submission form.
- Use your understanding of power and energy concepts to calculate your electricity consumption and its cost. Can you reduce it?

### Submission

- **CAD Design:**

- Submit a CAD design for both Problem 1.1 and Problem 2.
- Preferably use Proteus or any other CAD designing tool.
- If you use an online CAD tool like Tinkercad, submit the link in a text file.
- Compress the CAD files and text file (if applicable) into a zip file named **01xxxxxxxxx\_task2.zip**. and upload it to your drive.
- **Or** you can upload all your files to a google drive folder and share the folder itself
- Ensure that the drive links are set to "public" or "anyone with the link".

- **Video Explanation:**

- Record two videos (maximum of 2 minutes each) for Problems 1.1 and Problem 2.
  - Explain your work in each video, even if the design is not working.
  - Upload the videos to your drive and send the links through the provided form.
  - Ensure that the drive links are set to "public" or "anyone with the link".
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- For problem 1.2, problem 3 and the bonus session's questions, provide answers to these problems within the form itself alongside the session's bonus questions.

# Task 2: Heroic Hardware Challenges

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- Any approaches which will introduce protection to the circuit will give bonus points
- Submission Link  
<https://forms.gle/GV9Ea6Pmn9BaENkq6>
- The Task's deadline is 21/7 11:59 PM.
- Q&A Sheet (if you have any question regarding the sessions or the task) :  
<https://docs.google.com/spreadsheets/d/1WUggTbnBDQAPpbnZGWnbDHMmRYIX25TW751P2cldyGI/edit?usp=sharing>
- **Cheating is severely penalized**