



ELECTRICAL TEAM TRAINING

TASK 2

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PREFACE



While the Gru is planning to steal the moon. The "Home of Girls" holds a special place in the heart of the story as the residence of the three adorable orphaned sisters: **Margo**, **Edith**, and **Agnes**. This vibrant and bustling home embodies a sense of warmth, love, and unpredictability that comes with raising three spirited young girls. The house itself is a charming mix of creativity and chaos, with the walls adorned with their artwork and the rooms often in delightful disarray.

the Home of Girls is depicted as a place that **lacks light and windows**, creating an eerie and somewhat **unsettling atmosphere**. The absence of these traditional architectural elements contributes to the unique and unconventional aesthetic of the house.



TASK1.1- Lightning the Dark

About

You are a person who possesses a genuine love for **helping orphans**, such a person understands that being an orphan can leave a void that transcends physical needs, and they strive to provide emotional support, guidance, and a sense of belonging.

So, you went to Home of Girls and saw the girls complaining from the **lake of the light** and you try to help with your knowledge of electricity.

Requirement

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

Appendix

- Power supply: [Power Supply - YouTube](#)
- Diode and its applications: [Diode and Applications - YouTube](#)
- Circuit Basics: [Circuit Basics - YouTube](#)
- Current limiting resistor: [Everything about LEDs and current limiting resistors - YouTube](#)

TASK1.2- Air Extractor to Fan

About

The **absence of windows** in the home of the girls can contribute to creating a hot and stifling atmosphere within the house. Without windows for ventilation, the air circulation might be limited, **trapping heat** and making the interior environment feel warmer than usual, especially during hot weather.

But you have a great idea, you see that there is no inlet to the outside air except the Air Extractor, but you know the air extractor has only one direction that takes dusty air from inside to outside, you think that it will be possible to convert this **air extractor to a Fan** for house cooling



Fortunately, the Home of Girls Air extractor is a DC motor you could easily create an H-bridge driver to control the motor and make it rotate in both directions to work as an Air extractor and also a Fan.

Requirement

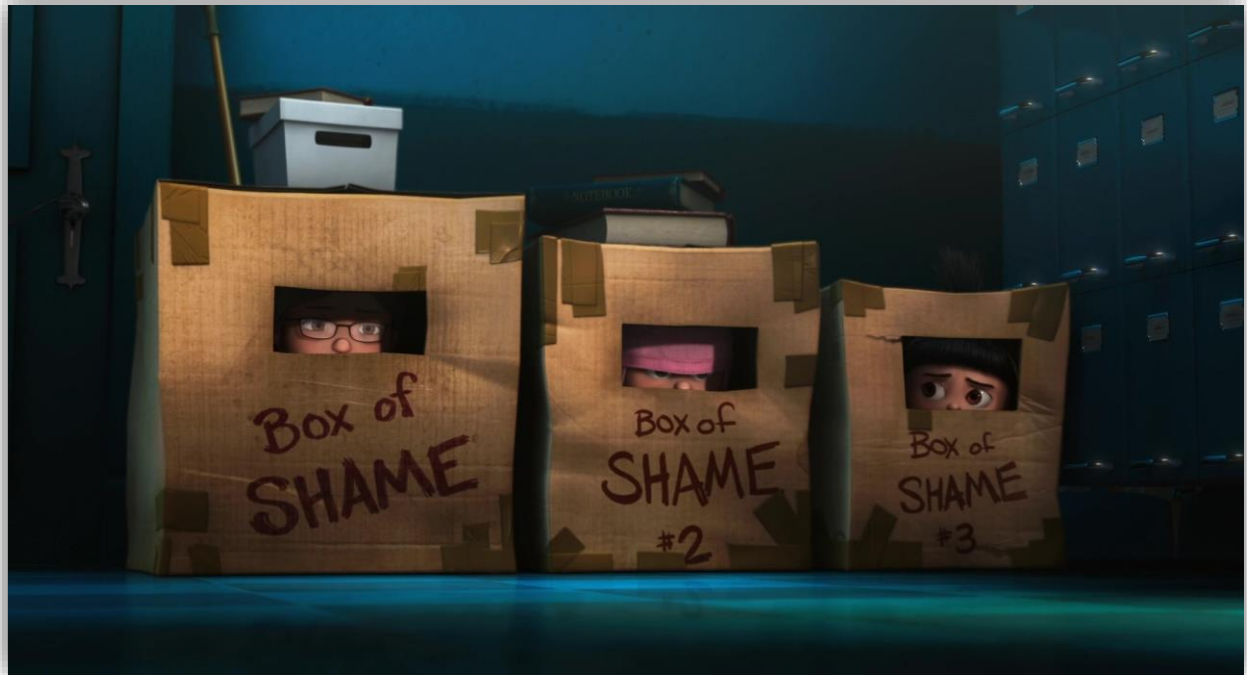
Design a simple **H-bridge** driver to control the direction of the DC motor using transistors.

Appendix

- Transistors: [Transistors BJT and MOSFET - YouTube](#)

TASK1.3- Box of Shame

About



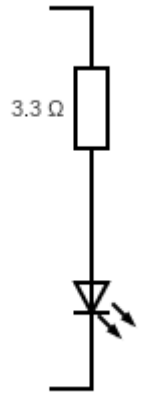
After you solve the lake of light problem in the room, you know that the girls have another fair which is **Box of shame** that the evil nanny used to punish the girls.

The biggest fear about the box of shame is that it's so dark and the little girl **Agnes** is so afraid from darkness.

This time we cannot take the input power from the grid and we need to deal with **batteries** to lightning up the Box.

Requirement

If you have a simple circuit that drive high power 12V LED with current limiting resistor 3.3Ω and need to drive them with 80C LiPo (lithium Polymer) batteries that have 5200mAh charge, assume that girls stay inside the box of shame for about 5 hours. How many batteries are connected in parallel to light up the LED for more than 5 hours



- Assume all batteries have equal voltage
- Assume the LED is ideal (deal with it as a short circuit in forward bias)
- The current limiting resistor is a high-power resistor.
- Battery datasheet: [Zeee 3S Lipo Battery 5200mAh 11.1V 80C with EC5 Connector Hardcase Bat](#)

Bonus

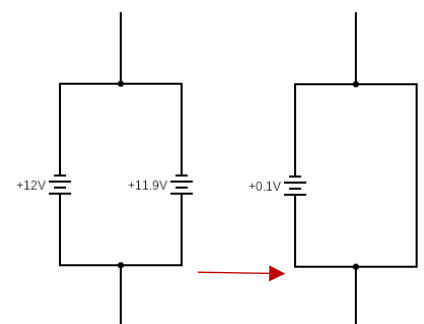
Propose an BMS Circuit that avoid the problem of connected batteries parallel with different voltages

CHALLENGING

The previous assumption that all batteries have equal voltage is not the case in the real world. Actually, when the battery loses its charge the output voltage decreases, as the curve shown

This will take us to a great problem which is connecting two batteries in parallel that have different voltages, thus, we need a **Battery Management System (BMS)**

The difference in the potential allows huge current to path through the two batteries and that may cause to damage them.



Appendix

- Power Supply: [Power Supply - YouTube](#)
- BMS [BMS Cell Balancing | Active cell balancing | Passive Cell Balancing | Battery Management System - YouTube](#)

SUBMISSION

- Submit a CAD design for problem 1.1 part 1 and problem 1.2 (preferably proteus).
- Answer problem 1.1 part 2 in the submission form and explain.
- explain the type of transistor you have used in problem 1.2 in the submission form.
- Submit a PDF file for the analysis of the circuit for problem 1.3.
- Write your ideas for the bonus problem and attach the circuits in the PDF file.
- Submitted files should have the format:
01xxxxxxxxx_task2.zip
- Submission link: <https://forms.gle/Fh1NkGz7oErD1Dqx7>
- Deadline: Friday Aug,18 11:59PM