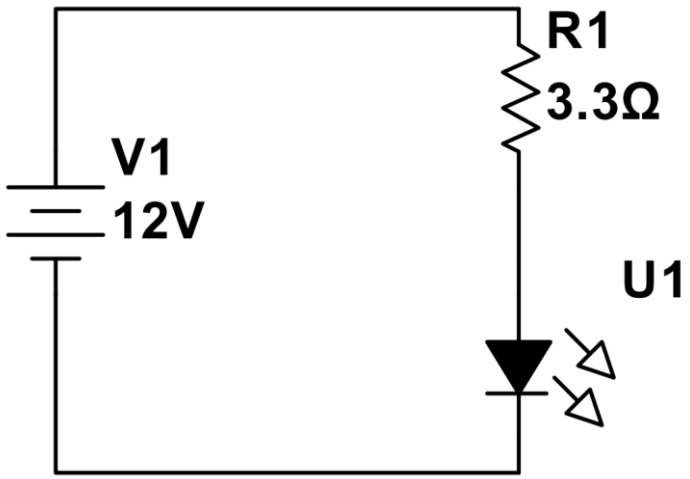
TASK1.3- Box of Shame



-Assumptions:

1- 30% of battery capacity is reserved for Over-charge or Over-discharge (like **SOC** doesn't exceed 90% and **DOD** doesn't exceed 80%)

2-nominal voltage for the battery = 11.1V (from data sheet)

3-diode is not ideal has a voltage drop = 3V(white led)

LED Color	Typical Vf Range
Red	1.8 to 2.1
Amber	2 to 2.2
Orange	1.9 to 2.2
Yellow	1.9 to 2.2
Green	2 to 3.1
Blue	3 to 3.7
White	3 to 3.4

-Calculations:

-Voltage drop across resistor = nominal battery voltage – led voltage drop =11.1-3 = 8.1V

- Current through the resistor = Voltage drop across resistor / Resistance =8.1/3.3 = 2.45A

-Effective battery capacity = 5200 * .7 = 3640 mAh = 3.64Ah

-C rate of the battery = Current/ Effective battery capacity = 2.45/3.64 = 0.673

-Time of discharging one battery = 1/ C rate = 1.486 hour

-Number of batteries required to light up the LED for more than 5 hours = total time / Time of discharging one battery = 5/1.486 = 3.36 ≈ **4 batteries**

-Battery Management System (BMS):

A Battery Management System (BMS) is a critical component in various battery-powered systems, such as electric vehicles (EVs), renewable energy storage systems, consumer electronics, and more. Its primary function is to monitor, control, and optimize the performance, safety, and lifespan of the battery pack.

Types	**Passive cell balancing**	**Active cell balancing**
Pros	1-less expensive to implement compared to active balancing. 2-simpler in terms of circuitry and components. 3-less expensive compared to active balancing.	1-Efficient Balancing. 2-Active balancing can maintain tighter voltage tolerances between cells, leading to increased overall pack efficiency and capacity utilization.
Cons	1-assive balancing is generally slower compared to active balancing. 2-Passive balancing doesn't offer the same level of precision in voltage equalization as active balancing. 3-Heat Generation.	1-Complexity 2-More expensive than passive balancing
Hardware Implementation