



**University of Zambia-UNZA,
School of Engineering,
Department of Electrical and Electronics
Engineering**

UNZA, School of Engineering Department of Electrical and Electronics Engineering EEE Group.	EEE3112 Electrical Engineering Practice	
	Min Project: Electrical Drawing/ Design	
	Date: 14/07/2021	Due Date: 1/09/2021

Title: LED-Based Reading Lamp

1. Introduction

Load shedding is the common problem in Zambia where students are more affected. By keeping this problem in mind the group of technologists posted very simple, useful and inexpensive project using ultra-bright white LEDs which provide sufficient light for reading purpose which consume very low power i.e. 3 watts of power. It works like emergency light i.e. when AC mains failure, the battery backup circuit instantly light up the LEDs but when the power resumes, the battery supply is automatically disconnected and this circuit again works on AC mains.

2. Objective:

- To build the LED based Reading Lamp circuit and analyze its performance using Multisim Software
- To modify the circuit so that when the AC main failure, the battery backup circuit instantly light up the LEDs but when the power resumes, the battery supply is automatically disconnected from supplying the LEDs and is being recharged.
- To modify the circuit so that it can be supplied from the solar system

3. Research Questions:

What is the rating of the LED based reading lamp? What is the total cost of the LED based reading lamp you have built? How long can it be (LED based reading lamp) used for lighting

before the battery is completely discharged? What is the total power loss in the circuit? What modification is needed to be made to the circuit diagram if the circuit is to be supplied from solar system?

4. Circuit Description Of LED-Based Reading Lamp

For power section the circuit of LED-based reading lamp use bridge rectifier connected to secondary coil of 0-7.5V, 500mA step-down transformer X_1 . Pulsating DC from output of rectifier is given to input of voltage regulator IC_1 for pure DC output. All LEDs (LED_1 to LED_{10}) is connected in parallel across the output of voltage regulator. Here resistors R_1 to R_{10} are connected in series with the LEDs respectively to limit the current. In this circuit 5 more LEDs can be used for lamp to increase intensity in the same manner used. When AC mains available relay RL_1 energized and disconnect to battery and vice-versa on absent of AC mains. For charging battery, a lead from rectifier is directly connected to positive and negative terminals of battery. Here diode D_5 and D_6 is used as reverse-current protection diode that don't allow the battery current to flow towards the supply section and diode D_7 is for reverse polarity protection.

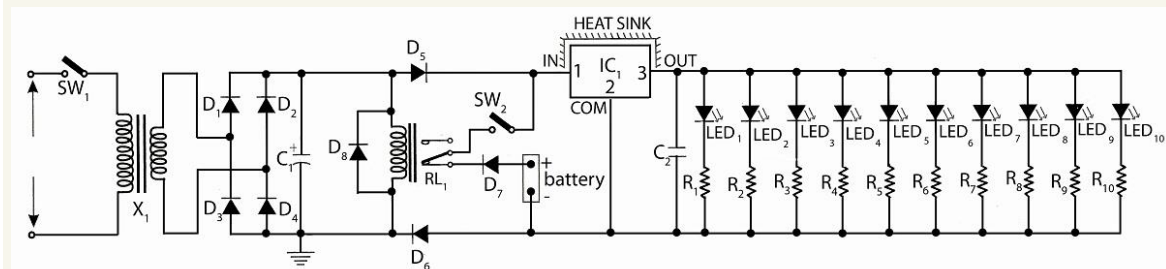


Figure 1: LED-based reading lamp

5. Parts List:

Resistors (all 1/4-watt, $\pm 5\%$ Carbon)

- ❖ $R_1 - R_{10} = 56 \Omega$

Capacitors

- ❖ $C_1 = 1000 \mu F / 16V$
- ❖ $C_2 = 0.1 \mu F$

Semiconductors

- ❖ $IC_1 = 7805$ Voltage regulator
- ❖ $D_1 - D_8 = 1N4007$
- ❖ $LED_1 - LED_{10} =$ White LED

Miscellaneous

- ❖ $RL_1 = 6V, 100 \Omega$ 1C/O Relay
- ❖ $X_1 = 230V$ AC primary to 0-7.5V, 500mA secondary transformer

- ❖ $SW_1, SW_2 =$ On/off switch
- ❖ 6V, 4Ah Battery
- ❖ 6V, 4Ah Battery terminal
- ❖ Heat sink for voltage regulator IC

6. Report:

The report should include the following:

- ❖ Introduction
- ❖ Problem Statement
- ❖ Objective
- ❖ Circuit Diagrams
- ❖ Results
- ❖ Discussion
- ❖ Recommendations
- ❖ Conclusion