

EE3007D

POWER ELECTRONICS

PROJECT REPORT

Submitted by:

1. GSBS GIRI SHANKAR – B200273EE
2. LALAM SAI DATHU – B200290EE
3. MOGULLAPALLY SUDHEEKSHNA – B200262EE
4. RAMAKURTHI RAJITH – B200313EE
5. BURJA SAI MANOHAR – B200339EE



DEPARTMENT OF ELECTRICAL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY

CALICUT, NITC P.O., KOZHIKODE,

KERALA-673601

AIM:

To design and fabricate a suitable topology to use three 12 Volts 5 Watts LED bulbs in series from 230V, 50Hz AC supply in full brightness and half brightness.

DESIGN:

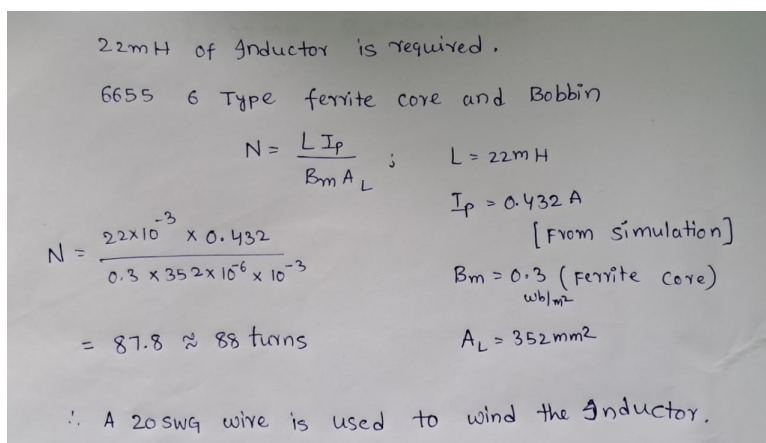
The three main parts of the design are:

- The given supply is 230V, 50Hz AC and using a step-down transformer the value is stepped down to 24V AC which has the peak value of 36V.
- The 36V AC is now changed to 36V DC using a full wave rectifier.
- Using Buck converter voltage required for full brightness and half brightness will be attained by changing the duty cycle.
- 36V is needed for full brightness and 25V is needed for half brightness. Therefore, a buck converter with duty cycles of 0.95 and 0.70 are used.

To get the following conditions, we need to design the following components:

- Inductor of suitable inductance
- Suitable pulse generation method

Design of Inductor:



Handwritten calculations for inductor design:

22mH of Inductor is required.

6655 6 Type ferrite core and Bobbin

$$N = \frac{L I_p}{B_m A_L} ; \quad L = 22 \text{ mH}$$
$$N = \frac{22 \times 10^{-3} \times 0.432}{0.3 \times 352 \times 10^{-6} \times 10^{-3}}$$
$$= 87.8 \approx 88 \text{ turns}$$

$I_p = 0.432 \text{ A}$
[From simulation]

$B_m = 0.3 \text{ (ferrite core)}$
 wb/m^2

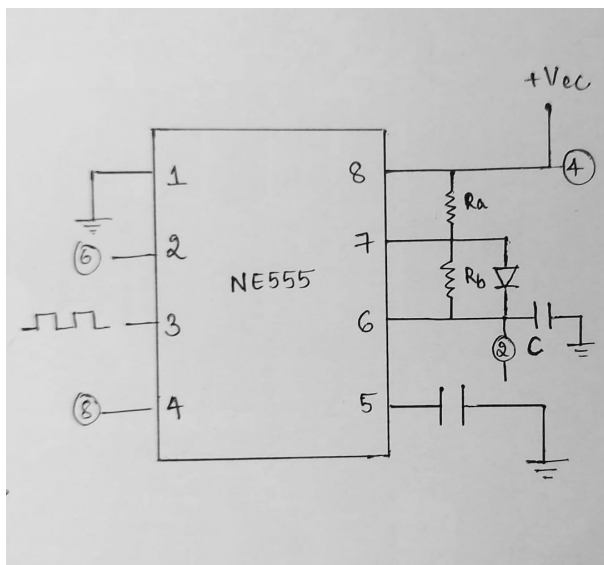
$A_L = 352 \text{ mm}^2$

∴ A 20SWG wire is used to wind the Inductor.

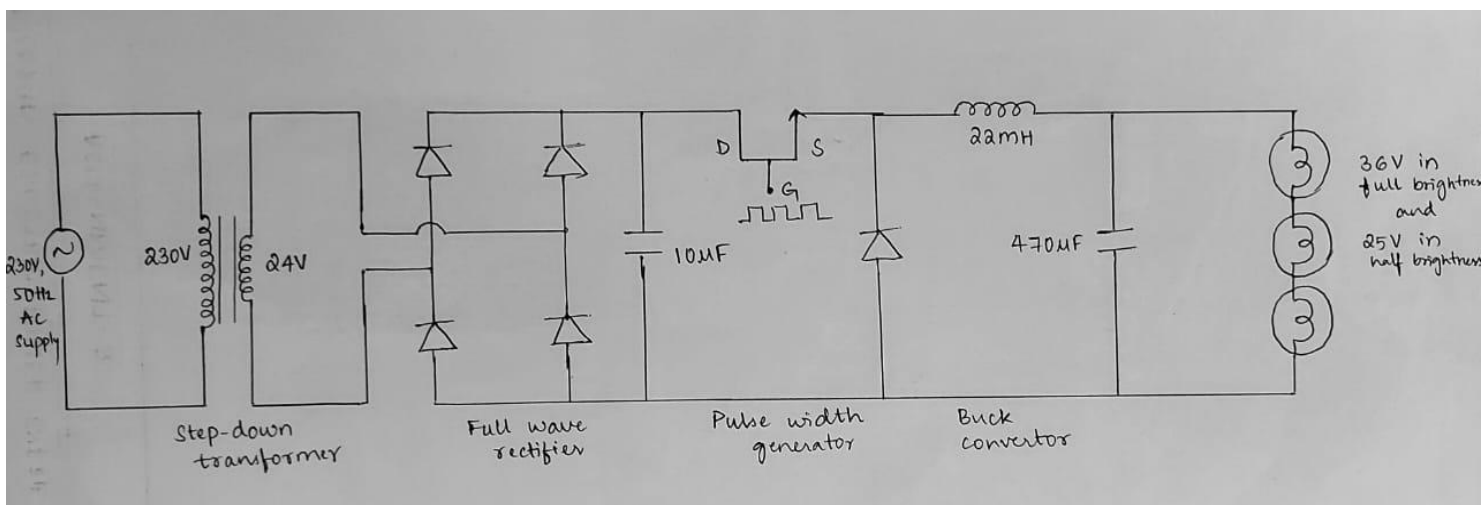
Pulse Generation:

- For Pulse generation we used 555 timer, which produces 25KHz of frequency and a vast range of duty cycle by varying the potentiometer with 9V battery supply.
- In the design of 555 timer 47K ohm pot is used, which is used to vary the duty cycle.

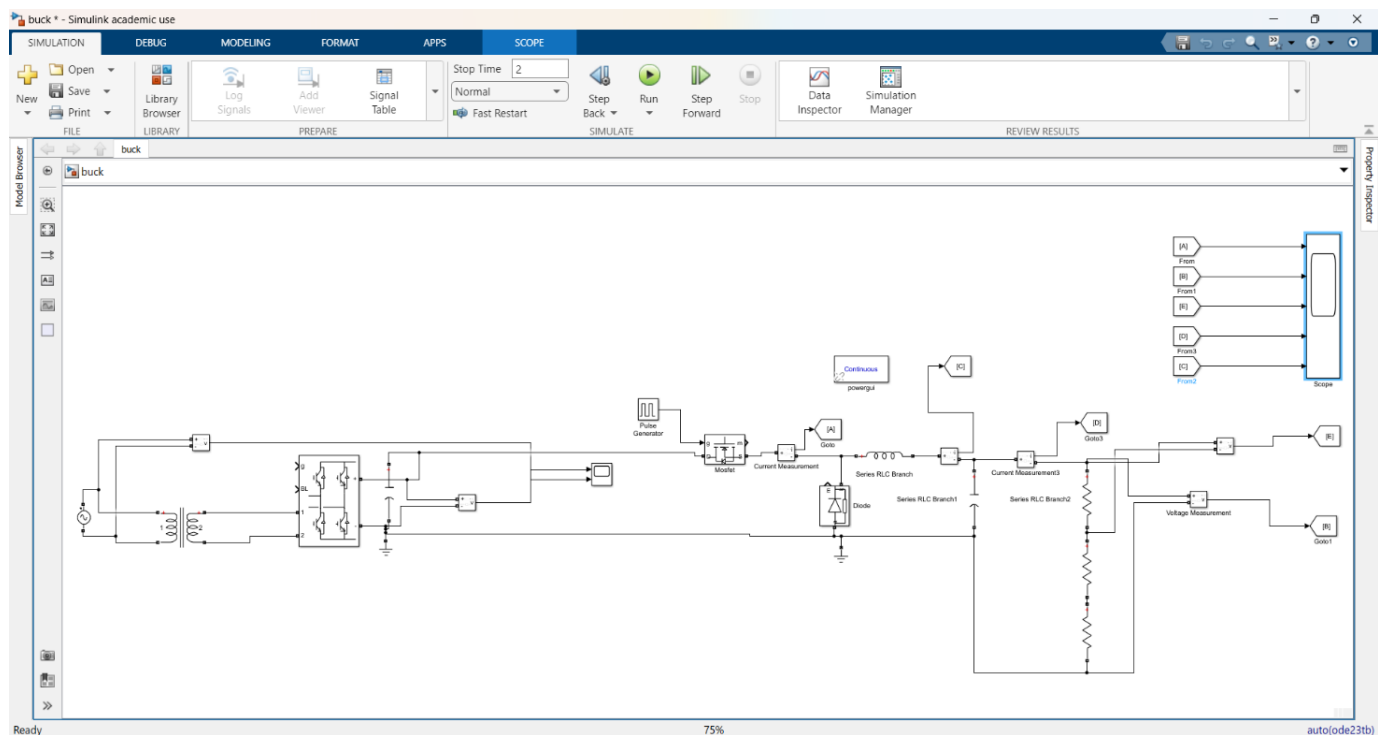
555 Timer circuit diagram:



SCHEMATIC CIRCUIT DIAGRAM:



SIMULATION:

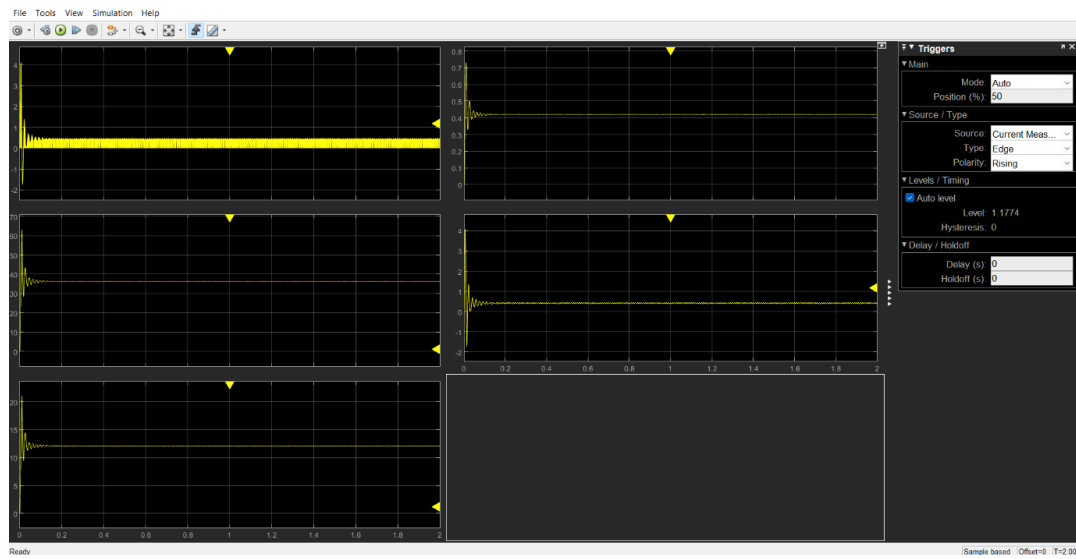


SIMULATION RESULTS:

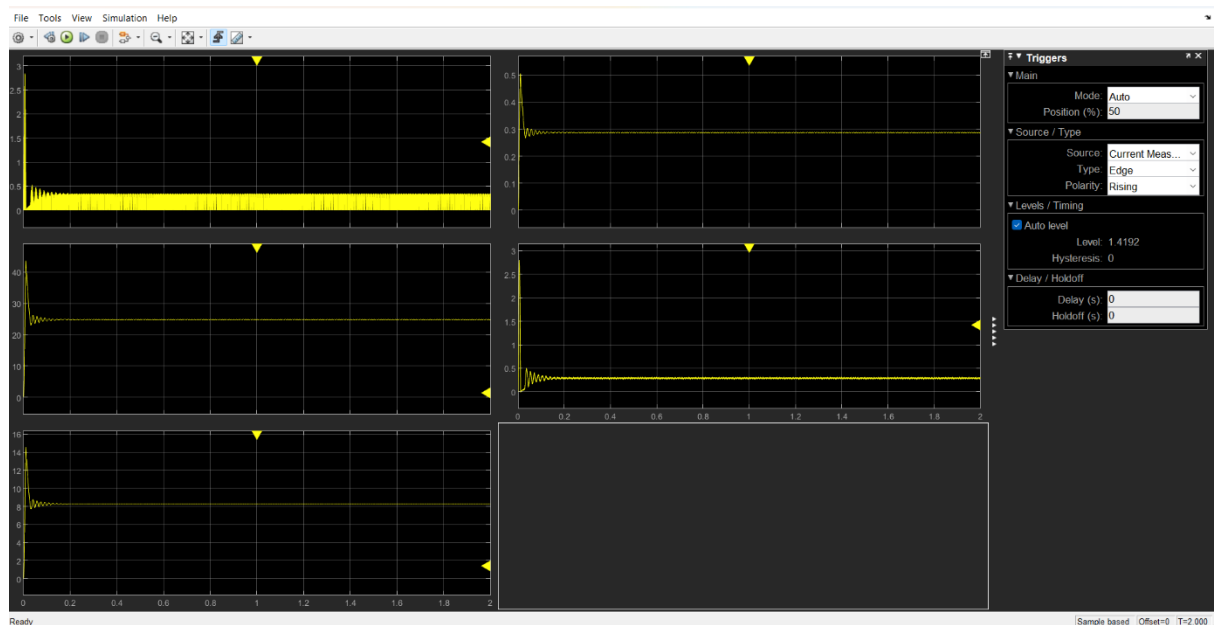
The graphical results obtained from the simulation are:

1. Switch current
2. Total voltage across 3 bulbs
3. Voltage across the single bulb
4. Load current
5. Inductor current

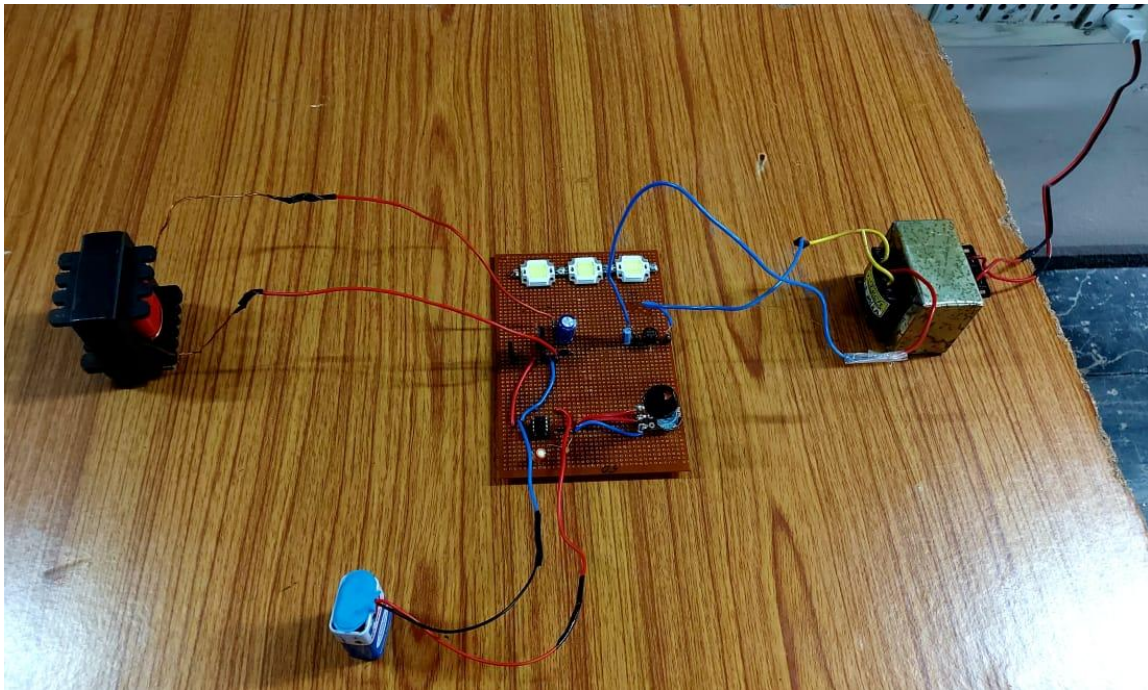
1. Graphical Outputs in Full brightness



2. Graphical Outputs in Half brightness



HARDWARE:



HARDWARE RESULTS:

1. Hardware Output in Full brightness 2. Hardware output in Half brightness

