

Mobile Charger Lab Report

EE3900: Linear Systems and Signal Processing

Indian Institute of Technology Hyderabad

Naresh
AI21BTECH11006

1. AIM

The aim is to build a working mobile charger. The circuit must output 5 V DC to charge a mobile phone after taking 230 V AC as input.

2. MATERIALS REQUIRED

- 12-0-12 Transformer
- 4 diodes
- 100 μ F Capacitor
- 7805 Regulator
- Output pin
- USB cable

3. CIRCUIT DIAGRAM

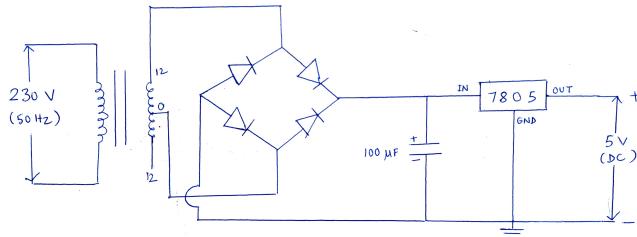


Fig. 3.1. Circuit diagram of a mobile charger

4. CIRCUIT EXPLANATION

- The transformer steps down the 230 V AC main supply to 12 V AC. Note that these are RMS voltages. The peak voltage will thus be $12\sqrt{2} \approx 20$ V. The transformed voltage is given by

$$v(t) = 12\sqrt{2} \sin(100\pi t + \phi) \text{ V} \quad (4.1)$$



Fig. 4.1. CRO output after transformer

- The alternating current now passes through a bridge rectifier. The output is a pulsating DC wave whose peak is $12\sqrt{2}$ V. The voltage at this stage is given by

$$v(t) = 12\sqrt{2} |\sin(100\pi t + \phi)| \text{ V} \quad (4.2)$$

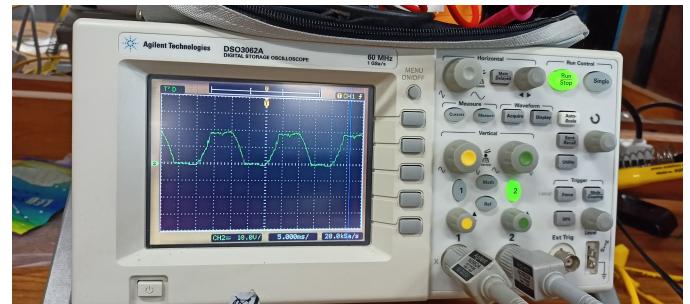


Fig. 4.2. Rectified output

- A capacitor is used as a low-pass filter here to choose only the zero frequency component thereby converting the current into pure DC of $12\sqrt{2}$ V

$$v(t) = 12\sqrt{2} \text{ V} \quad (4.3)$$

- Finally, the 7805 regulator stabilizes the output by eliminating noise and converts it into 5 V

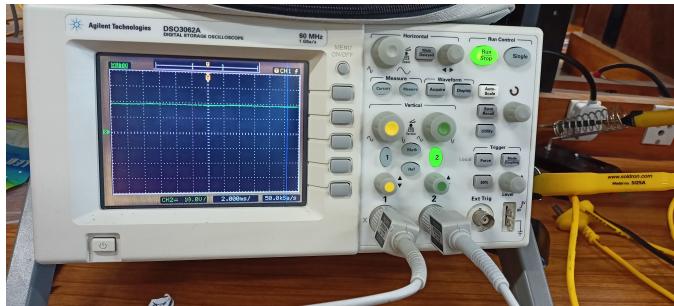


Fig. 4.3. Filtered output

DC which is then used to charge the mobile phone.

$$v(t) = 5 \text{ V} \quad (4.4)$$

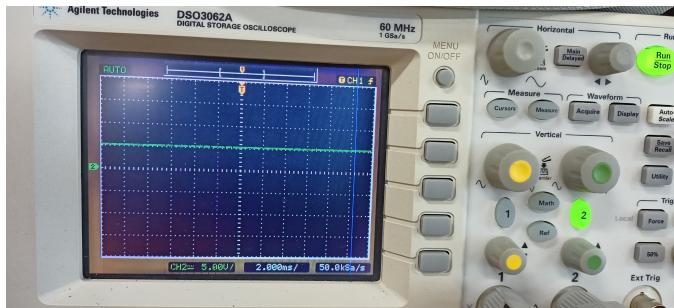


Fig. 4.4. Regulated output

5. OBSERVATIONS

Using a multimeter, we can verify that the output obtained is indeed 5 V DC.