5V DC Mobile Charger

Contents

***Abstract*—This is a lab report for the 5 V charger using a low pass analog filter.**

1 Circuit

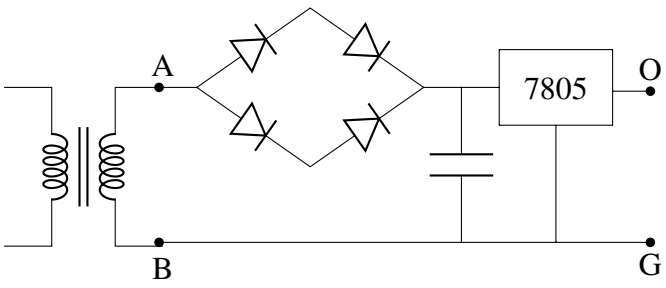
1.1 Components

The key components of the charging circuit are:

1) Step-down transformer (12-0-12)
2) Full-wave bridge rectifier
3) RC filtering circuit
4) 5 V Regulator (7805)

1.2 Diagram

The schematic diagram of the entire circuit is shown below.



1.3 Explanation

The transformer is a centre-tapped 12-0-12 step-down transformer. The output of the transformer is a 12 V, 50 Hz AC sinusoidal wave. This is shown in Result-1.

We form a full-wave rectifier, using four diodes as shown in the diagram of the circuit. The output waveform at this stage is a DC 12 V, 50 Hz rectified sinusoid. This is shown in Result-2.

The 100 *mu*F capacitor acts as a first order analog low pass filter. The capacitor is a reactive device, and it offers high resistance to DC signal. So, itblocks the DC signals from entering, and sends DC into the alternate path in the circuit (towards 7805 regulator). The output waveform at this stage consists of the constant DC component. This is shown in Result-3.

The regulator used in this circuit is a 7805 regulator, which outputs a constant DC supply of 5 V with very little ripple. Thus, we obtain an almost constant supply of 5 V DC to charge a mobile phone.

2 Results

The screenshots of the waveforms at each stage are shown ahead.

1) Peak voltage after transformer and rectifier stage, $V_p = 18\,\text{V}$.
2) DC component after filter stage, $V_{DC} = 18\,\text{V}$.
3) DC component after regulator stage, $V'_{DC} = 5\,\text{V}$.

3 Screenshots

The screenshots of various stages of the circuit are shown below.

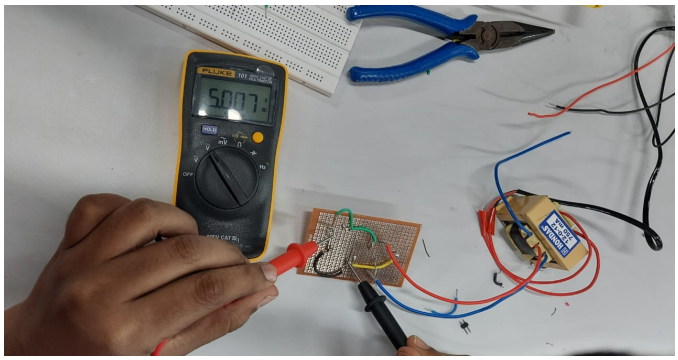


Fig. 3.1: Circuit Assembly

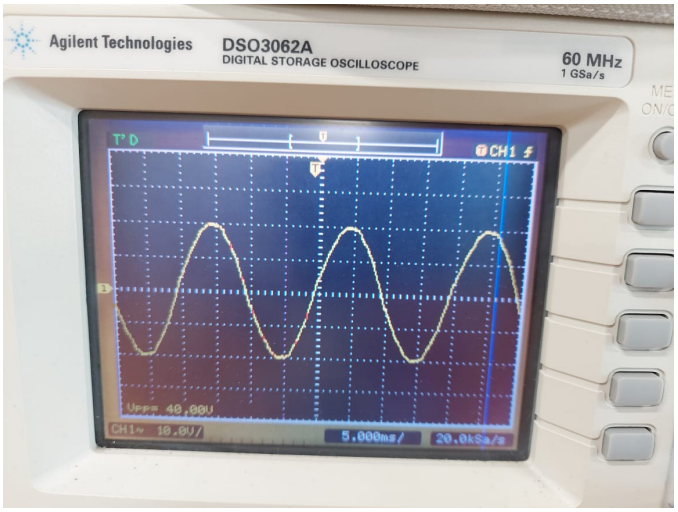


Fig. 3.2: Result-1 : Initial AC from transformer

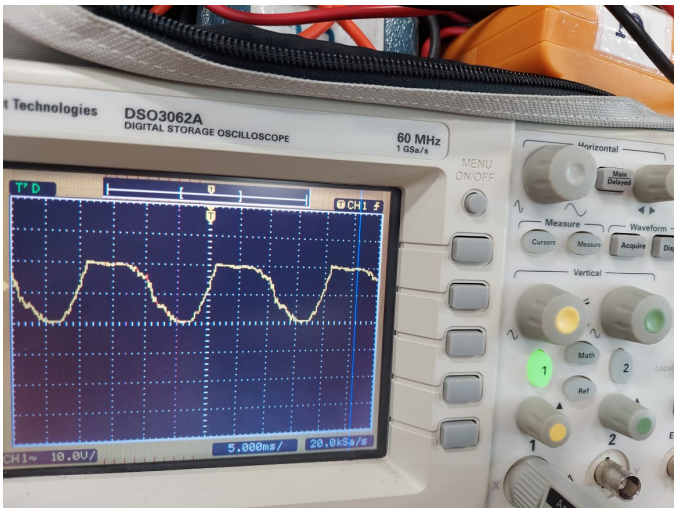


Fig. 3.3: Result-2 : AC signal after full-wave rectifier

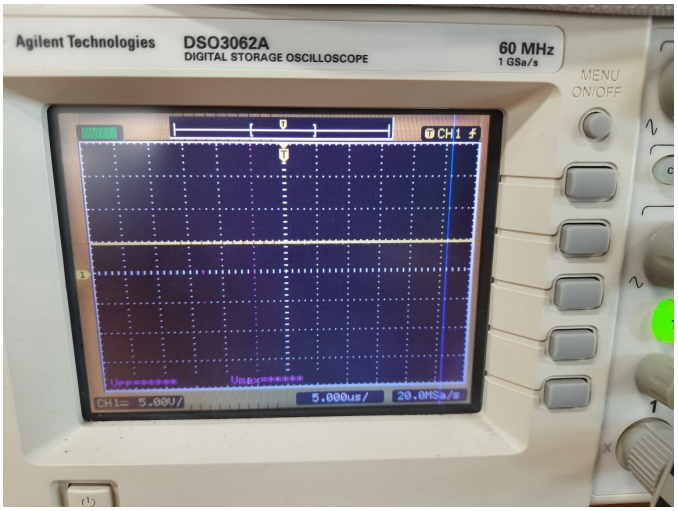


Fig. 3.4: Result-3 : Final DC output