Course Name:	**Elements of Electrical and Electronics Engineering**	**Semester:**	**I**
Date of Performance:	**17-10-23**	**Batch No:**	**C5_3**
Faculty Name:		**Roll No:**	**16010123325 (53)**
Faculty Sign & Date:		**Grade/Marks:**	**/ 25**

Experiment No: 3

Title: Mobile Battery Charger

Aim and Objective of the Experiment:

- To understand the working of Mobile Battery Charging Circuit
- To implement the circuit of Mobile Battery charger on Breadboard and observe the waveforms at various points (Input and output Waveforms for Bridge Rectifier) and measure the output voltage

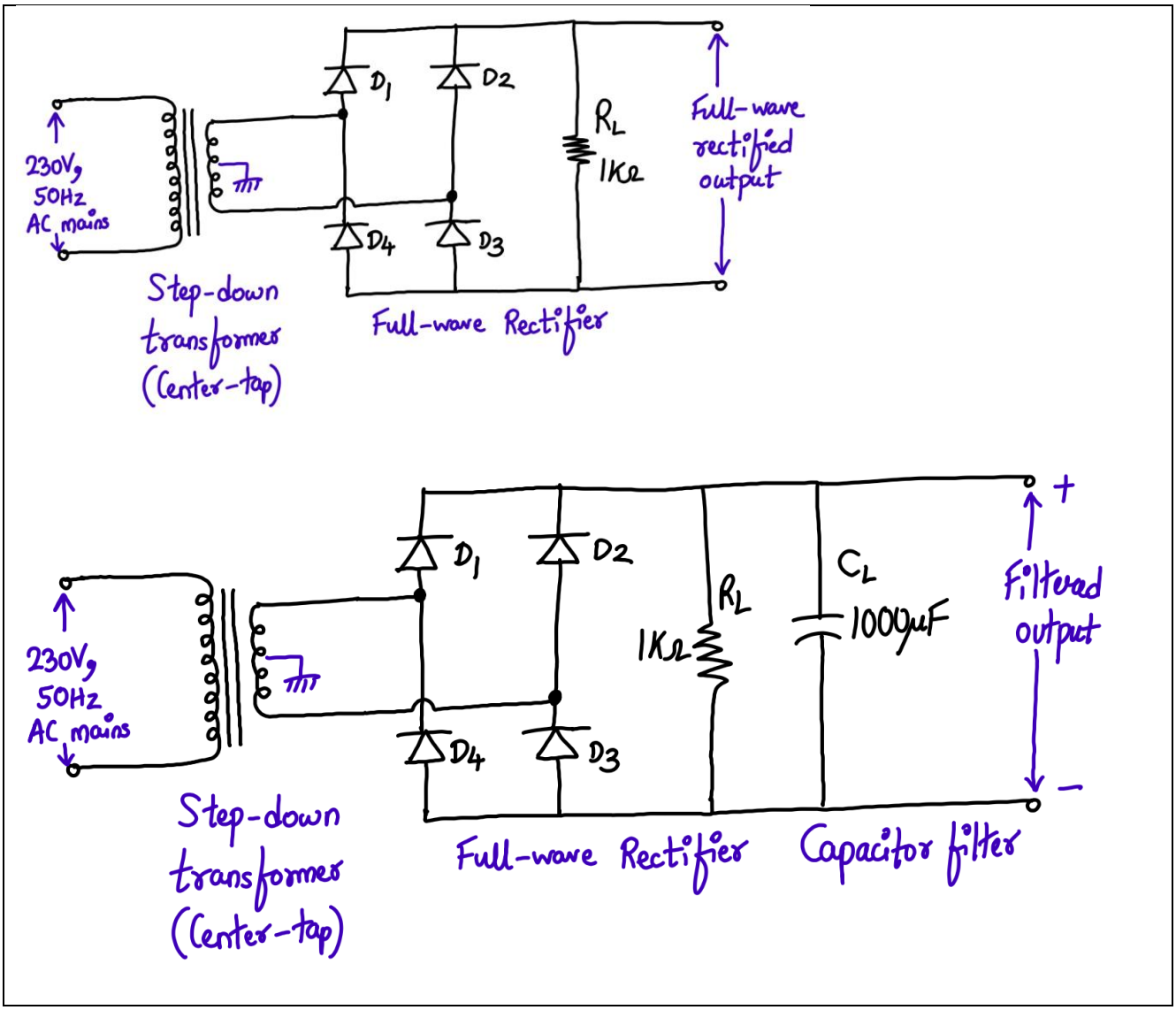
COs to be achieved:

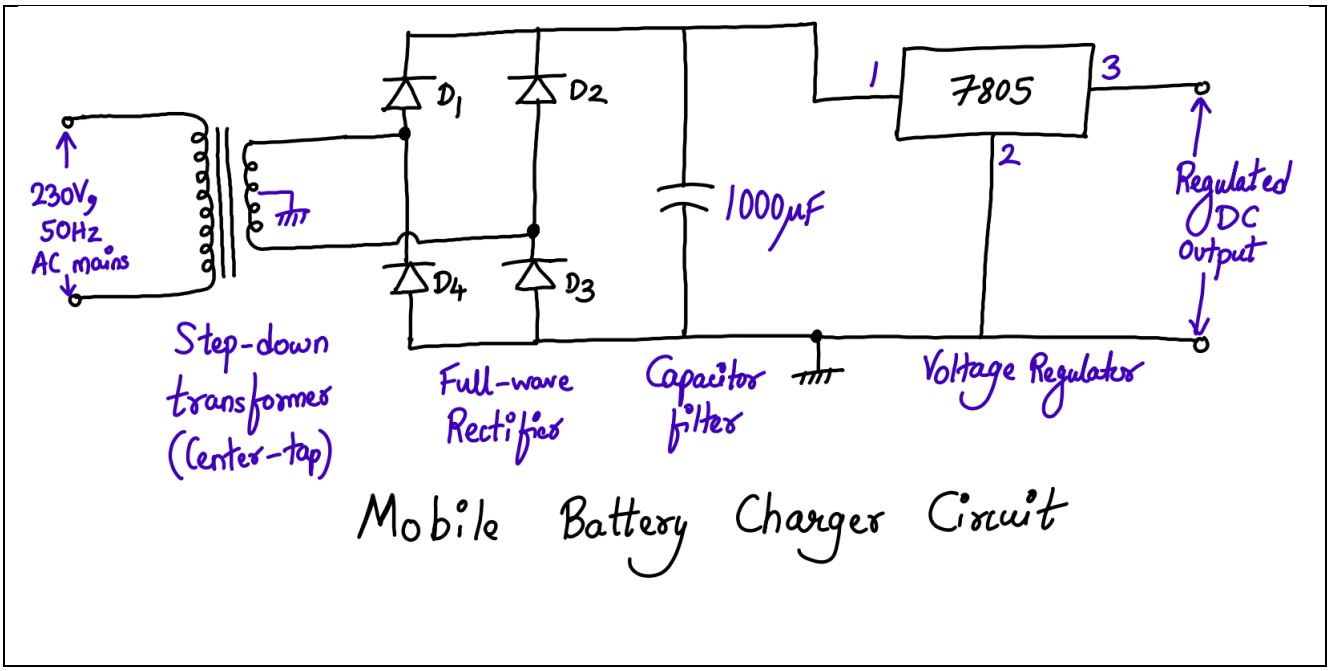
CO1: Analyze resistive networks excited by DC sources using various network theorems.
CO2: Demonstrate and analyze steady state response of single phase and three phase circuits
CO3: Understand principles and working of AC and DC machines with their applications.
CO4: Explain rectifier-filter circuits using PN junction diode and voltage regulator circuits using Zener diode

Requirements:

Step-down Transformer (6V-0-6V), Diodes(1N4007), voltage regulator IC 7805, Resistor, Capacitors, CRO, Digital Multimeter (DMM), breadboard, connecting wires, Micro USB cable, etc.

Circuit Diagram:


D1
D2
D4
D3
RL
1KΩ
Full-wave rectified output
230V, 50Hz AC mains
Step-down transformer (Center-tap)
Full-wave Rectifier
CL
1000μF
+
−
Filtered output
Capacitor filter

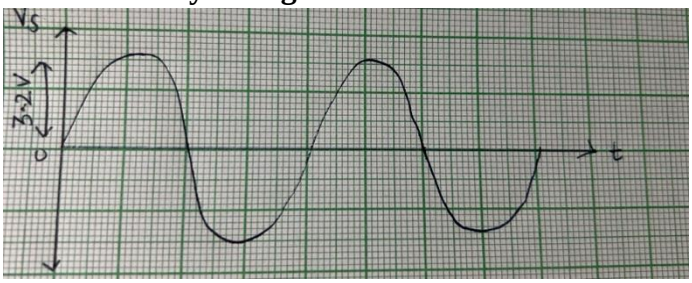


Stepwise-Procedure:

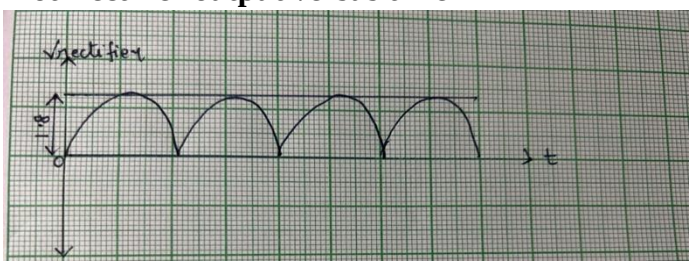
1. Design circuit and connect it as shown in the circuit diagram
2. Observe the waveform on the CRO at different points in the circuits.

Output waveforms observed on CRO:

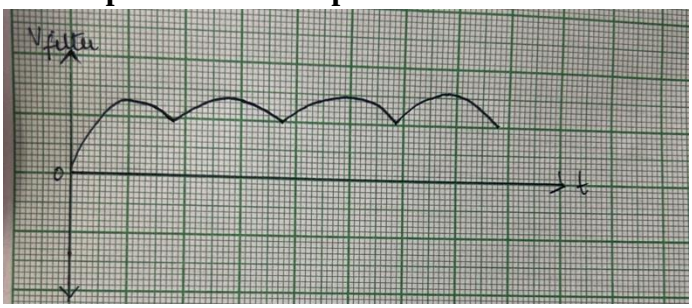
1. **Plot secondary voltage across transformer versus time**



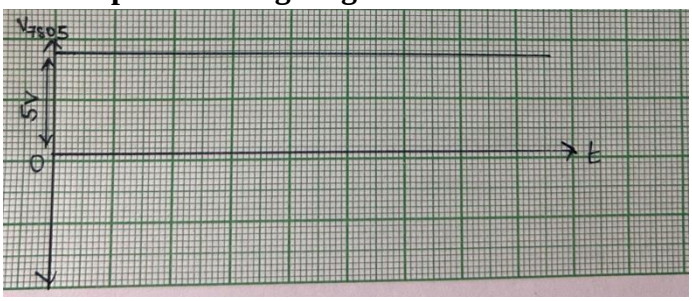
2. **Plot Rectifier output versus time**



3. **Plot Capacitor filter output versus time**



4. **Plot output of Voltage regulator versus time**



Observation Table:

Vin (p-p & rms) (input of Rectifier in Volts)	Vout(peak) Output of Rectifier (in Volts)	DC output of 7805 (in Volts)
(3.2 x 10) = 32	(1.8 x 10) = 18	5.04

Post Lab Subjective:

1. Explain working of Mobile Battery charger circuit
   Ans: A mobile charger is used to charge battery of the phone. As a battery gives DC voltage it also requires DC power to charge itself. But our household power distributors provide AC power because AC power transmission is easy. Now a battery requires very less DC power compare to power supplied at home, for that the charger needs to step down the voltage, for which a step down transformer is used. But the output of the transformer is still AC which will be converted to DC with help of full wave rectifier. The rectifier will give somewhat varying DC which is not completely constant. To reduce this variation, rectified output is passed into a filter. Low pass filter will give a smooth DC voltage. However this filtered output has some ripples which may harm the battery if this output is directly given to battery. For that regulator is used which will remove the ripples and will output pure DC power which is perfect for battery charging.

2. State commonly used types of mobile phone batteries

Ans:

- **Lithium-Ion (Li-Ion):** Lithium-ion batteries are the most prevalent type of batteries in modern mobile phones.
- **Lithium-Polymer (Li-Po):** Lithium-polymer batteries are another popular choice for mobile devices. They are thinner and more flexible than traditional Li-Ion batteries.
- **Nickel-Metal Hydride (NiMH):** While less common in modern smartphones, NiMH batteries were used in older mobile phones.
- **Nickel-Cadmium (NiCd):** NiCd batteries were once widely used in mobile phones but have been largely phased out due to environmental concerns, as cadmium is a toxic material.

3. Explain how to maximize Battery Performance/ Battery life of your mobile phone?

Ans:

To maximize the battery performance and life of your mobile phone:

- Adjust screen brightness

- Use dark mode if available
- Close unnecessary background apps
- Manage location services and data usage
- Use battery saver mode when needed
- Identify and remove battery-draining apps
- Avoid extreme temperatures
- Unplug the phone when fully charged
- Use genuine chargers and cables
- Consider replacing the battery if it no longer holds a charge well

4. Write important specifications of Voltage regulator IC 7805

Ans: The 7805 voltage regulator IC specifications:

- **Output Voltage**: 5 volts.
- **Input Voltage Range**: 7V to 35V.
- **Output Current**: Typically available in 100mA, 500mA, or 1A versions.
- **Dropout Voltage**: Approximately 2V.
- **Output Voltage Tolerance**: ±5%.
- Low quiescent current.
- Thermal protection in some variants.
- Various package types, commonly TO-220.
- **Three pins**: Input (VIN), Ground (GND), Output (VOUT).

Conclusion:

In conclusion, the mobile charger circuit experiment demonstrated the basic principles of converting AC power from a wall outlet to DC power suitable for charging a mobile device. It involved components like transformers, rectifiers, filters, and voltage regulators to ensure a stable and safe output voltage. The experiment highlighted the importance of efficiency and safety in power supply design, with an emphasis on avoiding overcharging and electrical hazards. Overall, it provided valuable insights into the fundamental workings of mobile charger circuits and their role in keeping our devices powered.

Signature of faculty in-charge with Date: