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| **Course Name:** | **EEEE** | **Semester:** | **I/II** |
| **Date of Performance:** | **25 / 11 / 21** | **Batch No:** | **G3** |
| **Faculty Name:** | **Milind Marathe** | **Roll No:** | **16010421071** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** |  |

**Experiment No: 5**

**Title: Mobile Battery Charger**

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| **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 |

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| **Requirements:** |
| Step-down Transformer (+/- 12 V), Diodes(1N4007), voltage regulator IC 7805, Resistor, Capacitors (1000µF, 100µF, 10µF, 0.01 µF), CRO, Digital Multimeter (DMM), breadboard, connecting wires, Micro USB cable, etc. |

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| **Theory:** |
| The Vsine having AC voltage acts as a source which has amplitude 230V and frequency 50Hz. This high voltage current is reduced with the help of step-down transformer, which has secondary inductance kept at 0.0027H. The Alternating current (AC) is rectified to a direct current using a rectifier circuit consisting of forward biased diode, 4 diodes are connected 2 in each pair so to convert two half cycles of AC into DC. An electrolytic capacitor is connected to filter out the AC. This DC current is further regulated with the help of a regulator IC 7805 and then again filtered with the help of an electrolytic capacitor of low capacitance. The oscilloscope connected in the circuit produces the corresponding waveforms which helps in determining the voltage of the current in every stage. Channel A is connected to the Vsine i.e., the source current. Channel B to the current entering the rectifier network. Channel C gives the waveform of the rectified current and Channel D gives the waveform of final rectified and regulated current. In the following screenshot of the waveforms produced by the digital oscilloscope (CRO), we can see that for channel B the value of each box is 5V and the waveforms produced has a peak value that nearly jumps to 2 boxes on both sides i.e., nearly 20V. So, we can say that the AC current input in the rectifier has a voltage <20V, nearly 17V. Similarly, in the case of channel C the waveform jumps nearly 2 boxes, the rectified DC current has a voltage <10V, nearly 7.42V. |

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| **Circuit Diagram/ Block Diagram:** |
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| **Stepwise-Procedure:** |
| 1. Design circuit and connect it as shown in the circuit diagram using Proteus simulator. 2. Run the hardware and take scree shot of it to attach in the output. |

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| **Output waveforms observed on CRO:** |
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| **Observation Table:** |
| |  |  |  | | --- | --- | --- | | **Vin(p-p )**  **(input of Rectifier in Volts)** | **Vout(peak)**  **Output of Rectifier (in Volts)** | **DC output of Charger (in Volts)** | | **17V** | **7.42V** | **5V** | |
| **Post Lab Subjective/Objective type Questions:** |
| 1. Explain working of Mobile Battery charger circuit.   Answer: The mobile battery charger circuit first reduces the current drawn from the source of very high voltage(230V) into low voltage by using step down transformer , then converts the alternating current(AC) drawn from the source into direct current(DC) using pair of diodes ,the capacitor are used to get the desirable voltage ,but still if the source voltage varies, the overall voltage of the circuit also changes drastically ,thus to ensure that we get the constant voltage always a rectifier is used ,at last one more capacitor is used of low capacitance to decreases the negligiable chances of varying voltage and thus we get the desire 5V that is required to charge the battery.   1. Explain the working principle of Turbo- charger for mobile phones.   Answer: When we use Turbo-charger, then the built in regulator allows more power into the battery than a normal traditional charger, which results in charging your device faster. For example In the above circuit if we used rectifier which provide 5V, 1A thus the output power is approx 5W , in turbo-chargers the rectifier used provide 5V,3A thus the output power comes out to be 15W therefore it requires less time to charge the phone . But if we use the turbo charger with the device which does not upport fast charging then it may damage sevearly and may result in blasting of battery too. The fast charging process can be defined in 3 steps:  *Stage 1* – Constant Current: Voltage increases towards its peak, while current stays constant at an elevated level. This is the phase where a lot of power is quickly delivered to the device.  *Stage 2* – Saturation: This is the phase where the voltage has reached its peak and current drops down.  *Stage 3* – Trickle/Topping: The battery is fully charged. In this phase, the power will either slowly trickle in, or will periodically charge a low “topping” amount as the phone consumes battery.   1. State commonly used types of mobile phone batteries.   Answer: The most commonly and widely used battery type in mobile phones are:   * Li-ion (lithium ion), * Nickel Cadmium(NiCd), * Lithium polymer(Li-pol), * Nickle metal hydride.  1. Explain how to maximize Battery Performance/ Battery life of your mobile phone?   Answer:   * Avoid charging full cycles(100%). * Avoid charging when device is heated up. * Use power saving modes. * Avoid installing third party battery monitoring apps. * Avoid charging when your device is being used. * When not in use turn of the mobile data/WI-FI. * Decrease brightness to 50% to 70%.  1. Write important specifications of Voltage regulator IC 7805.   Answer:   * 5V Positive Voltage Regulator. * Minimum Input Voltage is 7V. * Maximum Input Voltage is 25V. * Current rating Ic = 1A. * Internal Thermal Overload and Short circuit current limiting protection is available. * Junction Temperature maximum 125 degree Celsius. * Available in TO-220 and KTE package. * 7805 signifies two meaning, “78” means that it is a positive voltage regulator and “05” means that it provides 5V as output. So, our 7805 will supply a +5V output voltage. |

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| **Conclusion:** |
| This experiment helped us to understand the basic principle of charging mechanism how mobile battery circuit works and the different types of battery and how we can increase the battery life, we also came to know about different electronic components and there uses in circuit. |

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| **Signature of faculty in-charge with Date:** |