

Aim: To construct a mobile charger which supplies 4.99V to the mobile  
(convert 220AC supply to 5V DC supply)

Apparatus:

- 1) Transformer : 230VAC to 12V AC
- 2) Breadboard :
- 3) 4 diodes for full wave rectifier
- 4) Regulator (IC-7805)
- 5) Capacitors (2): (1000 $\mu$ F, 0.01 $\mu$ F)
- 6) connecting wires
- 7) Multimeter

Theory:

→ Transformer:

In this experiment, we use step down transformer. It is a device that transfers electric energy from one AC circuit to other.

Note that while transferring, it does not change the frequency, it only changes voltage (220V to 12V)

→ Bridge Rectifier:

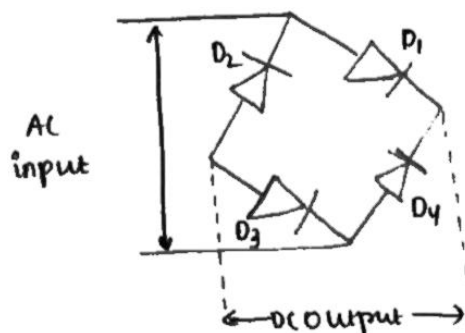
Circuit of four diodes that is used in process of converting AC from input terminals to direct current on the output terminal.

→ Diodes allow current to flow in one direction.

$D_2, D_3$  ---> forward biased

$D_1, D_4$  ---> reverse

In first half cycle - other half vice versa.



## Regulator:

It is a device that maintains the voltage of power source within acceptable limits a regulator atleast consumes 2V input voltage.

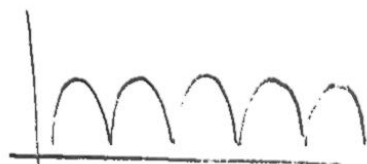
## Capacitor:

It does the work of smoothening or filtering. As output of DC has ripples these are filtered by the capacitor.

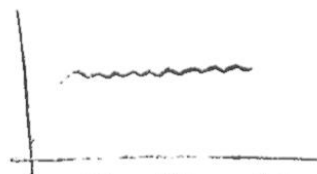
→ After achieving DC without ripples, then voltage regulator cuts down 12V value to 5V.

→ capacitor charges till waveform goes to peak and discharges into load circuit when waveform goes low.

So, when output is going low, capacitor maintains proper voltage supply into load.

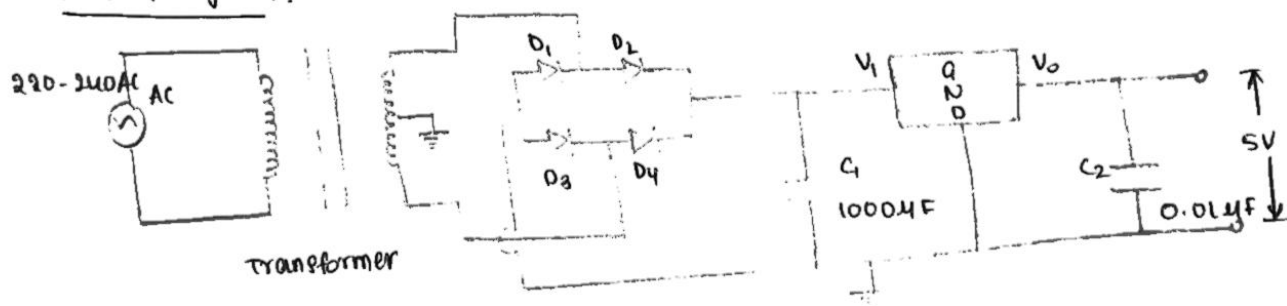


before filtration



after filtration

## Circuit Diagram:-



## Procedure:-

- Assemble all the parts according to the circuit.
- ensuring all the terminals are connected in right direction.
- using a multimeter, measure the voltage across the end opposite to the transformer (it needs to be 5V).

connect the USB port to the circuit and charge your phone.  
 For assembling according to the diagram join the input wires of transformer with 220V AC.

- The two middle pins of bridge rectifier are connected with output wires of transformer.
- Poles of capacitor are connected in parallel with positive and negative poles of the bridge.
- positive poles of capacitor is connected with input pin of voltage regulator and negative pole grounded.
- one capacitor is connected to regulator, first pin of USB connected from left, connected to output of regulator and 4<sup>th</sup> pin with ground.

### Observation :-

- on connecting the transformer to current source, the potential difference across 0.01μF capacitor is 5.014V.
- on connect it to a mobile phone it appears to be charging.

### Calculations :

$$\text{In capacitor : } V_{\text{peak}} = 13.89 \sqrt{2} = 13.89 (1.414) \\ = 19.50 \text{ or } 17.89 \text{ V}$$

$$(V_{\text{in}})_{\text{voltage reg}} = 17.89 - 2 V_{\text{diode}} \\ = 17.89 - 1.4 \\ = 16.49 \text{ V}$$

<u>Parameter</u>	<u>Theoretical Value</u>	<u>Practical Value</u>
Input voltage of stepdown transformer	230-250V (AC)	238.16V (AC)
Output Voltage of Stepdown transformer	12V (AC)	13.29V (AC)
peak voltage at input of voltage regulator	1-20V (DC)	17.89V (D.C)
output voltage at cap. (taking output of IC 7805 as input)	5V (D.C)	5.014V (D.C)

### Results:

Expected voltage = 5V

observed voltage = 5.014V

$$\% \text{ error} = \frac{0.014}{5} \times 100 = 0.28\%$$

### Conclusion:

Mobile charger with regulated 5V output was constructed.