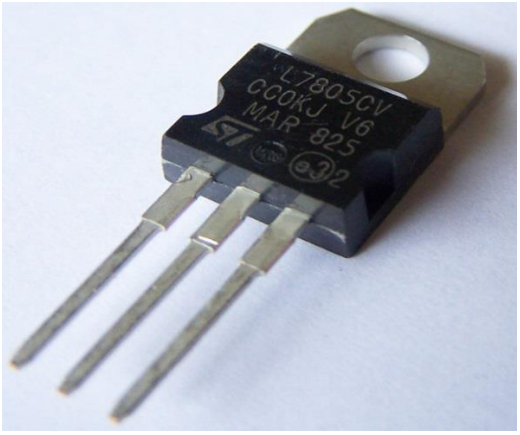
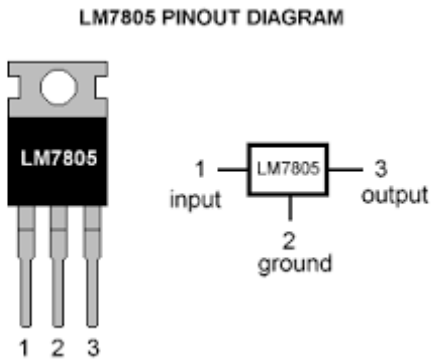
In this video we will convert 230V AC supply to different DC voltages (5V, 8V, 12 V and 18V) without using a tap transformer.

The various components used are:

1. Transformer- 230/24V, 1.5 A
2. Diode- 3A, 1N5408,
3. Electrolytic Capacitor- 100uF, 63V
4. Voltage Regulator- IC 7805, 7808, 7812, 7818
5. Bread board
6. PCB
7. Wires

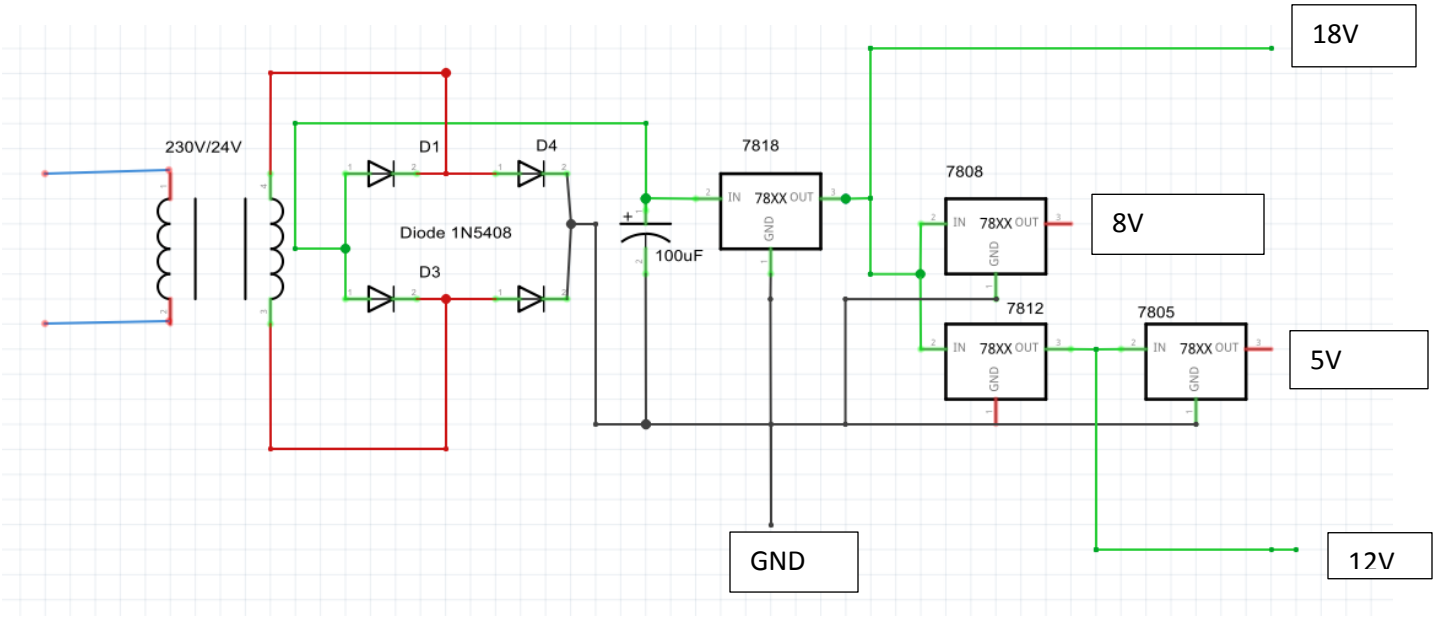
The 78XX IC's are used. These voltage regulators combine 17 transistors, 3 Zener diodes, and a handful of resistors into one handy package with three pins and a heat sink that helps dissipate the excess power consumed by the regulator as it compensates for increase or decrease in current drawn to keep the voltage at a constant level.





We use a 63V electrolytic capacitor (as a safety measure) because voltage rating of capacitor should be 50% more than the maximum voltage across it. Here the maximum voltage across capacitor is 40V.

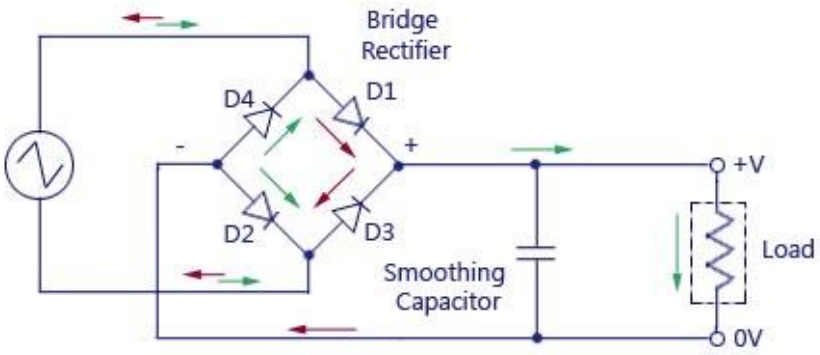
The circuit is connected as shown in the figure.

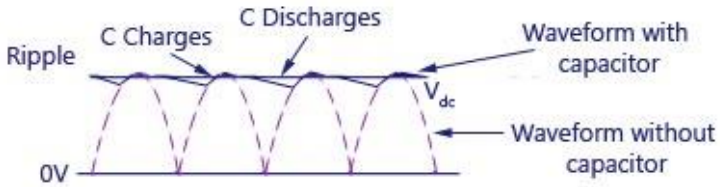


The AC supply 230V is stepped down to 24V AC using the transformer. Now the alternating current is rectified using full wave bridge rectifier into a pulsating DC current.

The four diodes labelled D_1 to D_4 are arranged in “series pairs” with only two diodes conducting current during each half cycle. During the positive half cycle of the supply, diodes D1 and D2 conduct in series while diodes D3 and D4 are reverse biased and the current flows through the load.

During the negative half cycle of the supply, diodes D3 and D4 conduct in series, but diodes D1 andD2 switch “OFF” as they are now reverse biased. The current flowing through the load is the same direction as before.





Resultant Output Waveform

We see that capacitor is used which smoothens out the ripples. If large current is drawn then we need to put big capacitor of 470uF. Large

capacitors require more time to discharge and hence we get smooth output.

Voltage across capacitor= (√ 2)*(V_{rms})

Where V rms=24V

Now the filter circuit passes the voltage on to the 7818 voltage regulator which holds the output voltage at 18V and the output of 7818 is given to 7812 and 7808 which gives 12V and 8V as output respectively. Similarly, output of 7812 voltage regulator is passed to 7805 and we get 5V as output voltage.

Moreover, we see that the heat generated is minimum in this process and can be measured as

Heat generated= (V_{out}-V_{in}) * $I_{flowing}$

So it is clear from above that larger the voltage difference larger will be the heat generated.

Type	Min	Max
7805	7	25
7806	8	25
7808	10.5	25
7885	10.5	25
7810	12.5	28
7812	14.5	30
7815	17.5	30
7818	21	33
7824	27	38

The above table shows that IC 7805 requires minimum 7V and maximum 25V as input to produce 5V as output. Similarly, the ratings of other IC's are given in the table.