تحذير هام: ممنوع توصيل الدائرة التي تقوم ببنائها بـ منبع التيار المتردد إلا تحت إشراف أستاذ المقرر أو أحد معاونيه

Design of a Linear Power Supply

Figure 1 shows a linear power supply consisting of three main parts: the transformer, the bridge rectifier, and the voltage regulator. Your objective is to design and construct a power supply that provides a fixed output voltage 15 V DC with a voltage ripple of 100 mV or less. You are expected to carry out the following steps:

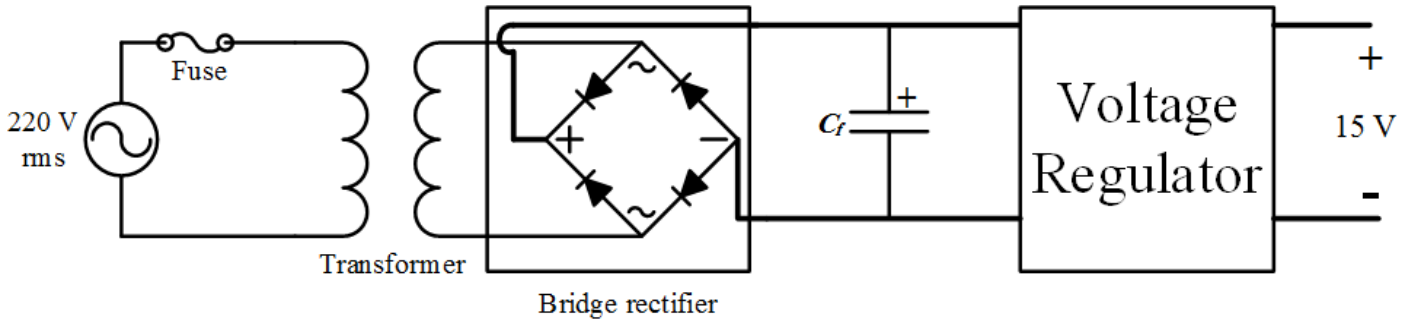

Figure 1: a fixed 15V DC Linear-Power supply

1. Search the Fairchild Semiconductor website (http://www.fairchildsemi.com) for an appropriate linear voltage regulator which provides output voltage = 15 V DC. Examine the data sheets for the voltage regulator. Specifically, determine the minimum and maximum allowable input voltages to the regulator. Also, determine the maximum output current of the device. What are the different types of packaging available? and what are the main feature(s) of each package?

2. Find out the input voltage to the regulator required to produce the required output voltage (15 V DC) according to specifications.

3. The input voltage to the regulator is the output of the rectifier. The peak value of the rectifier input voltage, V_{in} , is related to its peak output, V_{out}, through the relation

$$V_{out} = V_{in} - 2V_D$$

where V_D is the voltage drop across the diode. At this stage, determine the voltage rating of the filter capacitor C_f.

4. Knowing the input voltage to the rectifier bridge (**Hint**: it may **not** exceed 18 V rms), you can determine the transformer turns ratio since the input to the transformer is 220 V (RMS). Select a transformer according to your design.

5. Consult the data sheet of a typical silicon/germanium diode. **Take note of the specifications of the diodes/bridge** you are going to use.

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6. Construct a full-wave bridge rectifier. (Alternatively, you could get a **ready-made bridge rectifier** directly from the store).
7. Assume that a current of 1.0 A would be drawn from the bridge, **determine the value of the filter capacitor** C_f that would result in a peak-peak voltage ripple of 7.0 V. Make sure that the selected capacitor is able to withstand the peak voltage at the output of the bridge; otherwise, it may blow up!
8. Construct the power supply by connecting the transformer, the rectifier bridge and the voltage regulators. At the output of each regulator, connect a 10-μF **tantalum** capacitor. **Note**: tantalum capacitors are polarized capacitors, so, you should **watch out for the capacitor polarity**.
9. Equip your power supply with an appropriate **fuse** to be placed at the load side. What is the current rating of this fuse? The fuse should be placed in your circuit using a **fuse holder**.
10. Equip your power supply with an **ON/OFF switch** on the load side.
11. Equip your power supply with an **LED indicator** at the output terminal.
12. **Verify** the output voltage of your power supply.
13. Use a standard **AC power chord** for connecting your power supply to the AC mains (**Do NOT connect your power supply to the AC mains unless under direct supervision of the course instructor or one of his assistants**).
14. **Package** your power supply in a box with the AC power chord at the input and **output terminals** at the output.
15. **List the specifications** of your power supply, e.g. maximum output current, voltage regulation, output voltage ripples.
16. **Marking scheme**

    your project will be evaluated as follow;

No.	Task	Mark
i	Wiring is safe (i.e. no danger of electric shocks on the 220 volts AC side)	2
ii	Power supply able to produce output at no-load	4
iii	Output meeting the ripple specification at full load	2
iv	Circuit is neat	2