Week #4 Homework

1. Design a full-wave bridge rectifier circuit to deliver 10 V DC with less than 0.1 V_{pp} ripple into a load drawing up to 10 mA. Choose the appropriate AC input voltage (from the transformer: what's the turn ratio in the transformer to get down from the wall's 120 V?), assuming 0.6 V diode drops. Be sure to use the correct ripple frequency in the calculation.
2. Design a symmetrical clamp – one which confines a signal to the range -5.6 V to +5.6 V.
3. Design a +10 V regulated power supply (looks like a voltage divider with R_1 is a resistor and R_2 is a reverse-biased zener diode) for load currents from 0 to 100 mA; the input voltge is +20 V to +25 V. Allow at least 10 mA zener current under all (worst-case) conditions. What power rating must the zener have?
4. If you want a current source constant to 1% over a load voltage range of 0 V to +10 V, how large a voltage source must you use in series with a single resistor? Using a Thevinin model here really helps in this problem.
5. Suppose you want a 10 mA current in the preceding problem. How much power is dissipated in the series resistor? How much gets to the load?