

OVERVIEW FOR AC POWER, SEMICONDUCTING DEVICES, AC CIRCUIT AND RADIOS

SEMICONDUCTORS

- 0.) What is a semiconductor?
- 1.) What is the difference between an n-type and p-type semiconductor?
- 2.) How is a diode made? Also, how is a depletion zone generated.
- 3.) What is the symbol for a diode? What about an LED?
- 4.) Be able to tell the direction of charge flow in an AC and DC circuit in which exists a diode.
- 5.) Be able to draw a circuit for a *half-wave rectifier*. Be able to reproduce its output across its load resistor (that is, what waveform will be generated by the device?)
- 6.) Be able to draw a circuit for a full-wave rectifier. Be able to reproduce its output across its load resistor (that is, what waveform will be generated by the device?)
- 7.) What do *all* rectifiers do? That is, at their most basic, what is their purpose?
- 8.) How do you get rid of the lumpiness in a full-wave rectifier?
- 9.) What is ripple?
- 11.) What is the current characteristic (this is a graph—it's in the semiconductor pdf) for both *forward bias* and *reverse bias* of a diode?
- 12.) When you put two diodes back-to-back, what do you get? What do you need to do to make a device like this useful?
- 13.) What are the two types of transistors (what are they called)?
- 14.) For an npn transistor, what are the names of the terminals? How is this different for a pnp transistor?
- 15.) Be able to reproduce the circuit symbol for a n-p-n and a p-n-p transistor, and be able to tell the difference between a n-p-n and a p-n-p transistor by looking at its circuit symbol.
- 16.) What three things does the arrow in a transistor symbol tell you?
- 17.) For what two things are transistors used?

AC CIRCUITS:

- 1.) An **ammeter in an AC circuit** reads 4 amps. The number tells you something. In short, what is it?
- 2.) Give a more complete answer to the question (that is, what *is* an RMS current?).
- 3.) You see a circuit has a power supply whose voltage is $169 \sin 377t$. What do you know about the circuit?
- 4.) What does an **RMS** voltage tell you?
- 5.) An **AC power supply** characterized as $V(t) = 16 \sin 80t$ is put into an **RLC circuit** in which the inductance is 3 mH, the capacitance is $7 \mu\text{F}$ and the resistance is 180Ω .
 - a.) draw the circuit (complete with symbol for the AC power supply);
 - b.) Determine the **RMS value of power supply's voltage**;
 - c.) Determine the **frequency** of the power supply.
 - d.) If an **ammeter** were put in this circuit, what, *in general*, would its **reading** give you?
- 5.) The power supply from the previous problem stays the same, but the **frequency is changed to 3600 Hz**. All the circuit's parameters stay the same. That is, the inductance is still 3 mH, the capacitance is $7 \mu\text{F}$ and the resistance is 180Ω .
 - a.) What, in general, does the circuit's **capacitive reactive** tell you?
 - b.) In AC circuits, **capacitors** act like what kind of **filter**? What does this mean?
 - c.) What is the circuit's **capacitive reactance** X_C ?
 - d.) What, in general, does the circuit's **inductive reactive** tell you?
 - e.) In AC circuits, **inductors** act like what kind of **filter**? What does this mean?
 - f.) What is the circuit's **inductive reactance** X_L ?
 - g.) What, in general, does the circuit's **impedance** Z tell you? (
 - h.) What, in general, does the **phase shift** tell you?
 - i.) What is the circuit's net **impedance** Z ?

- j.) What is the circuit's *resonance frequency*?
- k.) What is the **current** in the circuit?
- 8.) Let's assume the RMS voltage of the power supply is 15 volts. Let's assume that the impedance of the circuit at a given frequency is 8Ω . What is the **RMS current** in the circuit?

RADIOS:

- 1.) What is the **mechanism that transfers information** from a radio station to a radio receiver?
- 2.) Be able to **draw a simple radio station circuit**.
- 3.) Why are there **no radio waves** below 500,000 Hz?
- 4.) What does the number associated with a radio station mean. That is, **KFWB's station number** is "98." What does that number tell you?
- 5.) What happens when an **electromagnetic wave passes** by a piece of metal like an **antenna**?
- 6.) How does an **AM radio select out** the **station** you've decided you want to listen to?
- 7.) What does **AM stand for? FM?**
- 8.) Let's say an AM radio station is given one million hertz to work with. **How does it put information on that wave?** Draw a sketch of the process.
- 9.) **Why** do you need a **diode in the speaker circuit**?
- 10.) **How** does an **AM radio decode the information** riding on the carrier wave?
- 11.) Be able to **draw an AM receiver circuit** (the entire radio circuit) with AND without amplification (that is, with a transistor to amplify the signal).