Electrical Engineering is a very broad area with an equally broad scope of topics. As you progress through the curriculum, it will be helpful to understand these foundational principles in order to make sense of any given subject matter. This article provides a list of some common problems in Electrical Engineering, which many students are often faced with when studying this topic. You can find descriptions, diagrams, and analysis for each problem on this list. In addition, I have provided common mistakes that students frequently make when solving these problems. In each section, you will see a prompt followed by an analysis of the problem. Some problems have been taken from actual homework assignments from several of my college courses, while others were thought up to illustrate a particular feature or concept. I've tried to use interesting and non-trivial problems in order to make this list as useful as possible. 1) Voltage Across a Capacitor with Resistive Load – When a capacitor is connected across a resistor load, the voltage across the capacitor initially increases as charge flows into it from the resistor. Once the capacitor is fully charged though, the voltage across the capacitor does not change even if charge flows into it from the resistor. This effect is due to the resistance that is introduced by the loading resistor. Initially, when current flows into the capacitor for the first time, there are no charges on its plates and hence they are at a voltage of zero volts with respect to each other. Since current only flows through a capacitor when there are charges on its plates, current will start flowing through this circuit as charges begin to accumulate on its plates. As charge accumulates on one plate of this capacitor, it creates an attraction of opposite charge on its other plate (i.e. it becomes polarized), which causes charge to continue to flow into the capacitor until both plates are fully charged. This problem is often incorrectly solved by drawing a graph of voltage across the capacitor versus time, then taking the derivative of this graph with respect to time to determine the current. This approach will give you the current that is being supplied via the resistor. However, because both plates of this capacitor are fully charged, there is no further charge transfer through this circuit and thus no current will flow in this circuit. To correctly solve this problem, you should use Kirchhoff's Voltage Law (KVL) on the loop formed by points A through D in Figure 1(a) below. From the above equation and the right-hand rule for charges, we can see that: Since we don't know the voltage across the resistor, we will calculate that using KVL before finding out what current flows through this circuit. Therefore, we calculate: Then by using KVL again and calculating: This problem is frequently introduced to students when trying to solve circuits with a resistor and capacitor. Students often incorrectly assume that if a circuit contains a capacitor and resistor, then it must dissipate energy because of an additional internal resistance in the form of voltage drop across the capacitor.

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