Electrotechnology Lab report #3

Marek Betka

16324334

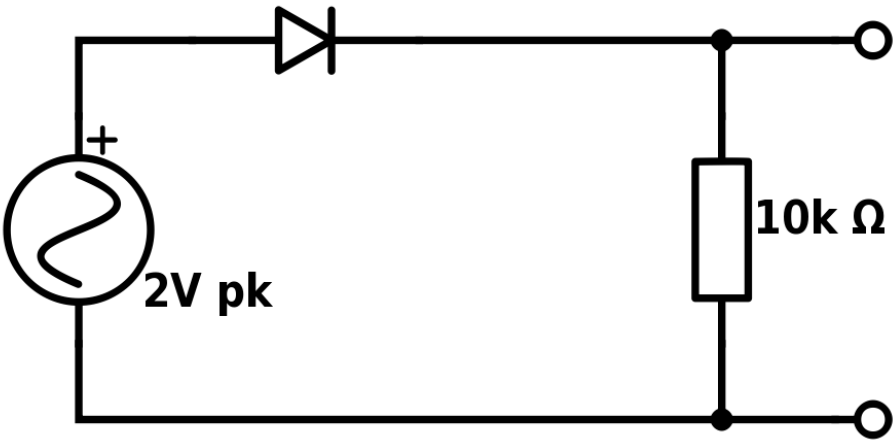
2/12/2016 (Lab 1: 2.00-4.00pm)

Part one: Diode and resistor

Method:

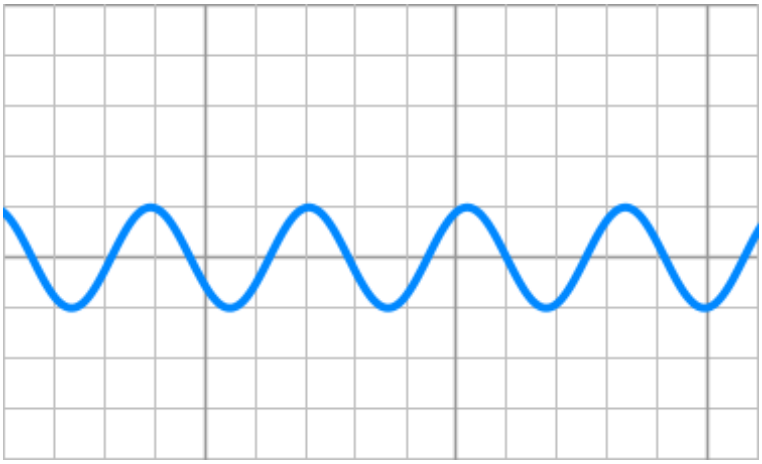
1. The circuit was set up as shown in the diagram, initially with no capacitor, and only a diode and a resistor.

Circuit Diagram

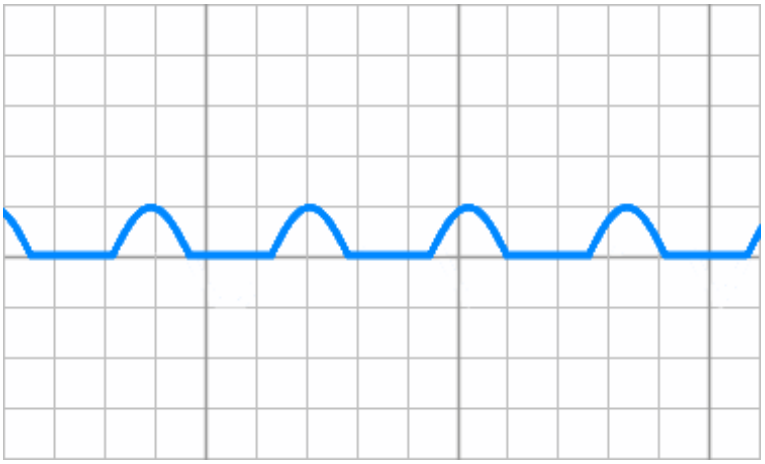


Results:

The input AC voltage looked like the following diagram:



But after the AC power had to pass through the diode and the 10k Ω resistor, the wave formed looked like:



Interpretation:

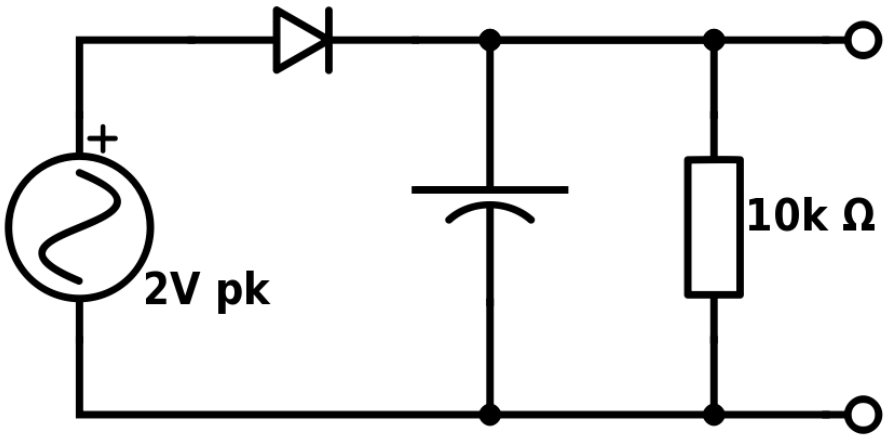
The resistor stops nearly all the voltage from passing to the other input of the scope and since the diode is placed at the start of the circuit, it only allows the voltage to go one way for the positive side, but not the negative.

Part two: Effects of a capacitor on an AC circuit

Method:

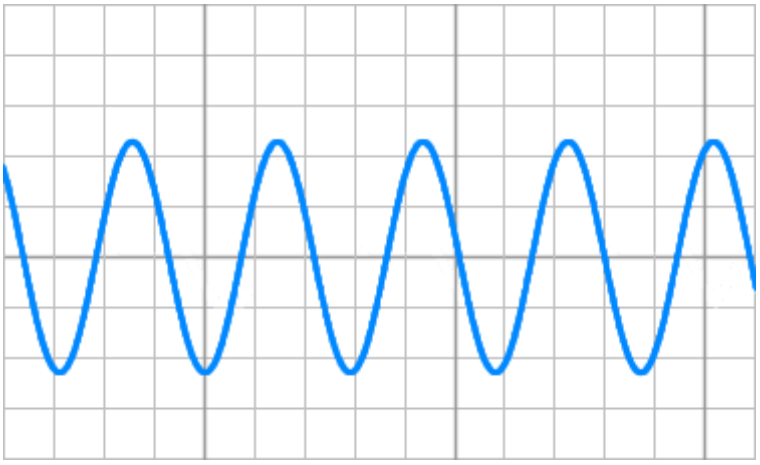
1. The circuit shown previously was modified by adding a polarised 1 μF capacitor into the circuit
2. The input frequency was also tested with 200Hz and a 20k Hz
3. The waveform was then sketched for both frequencies
4. This same process was repeated for a 10 μF capacitor in the circuit

Circuit Diagrams:

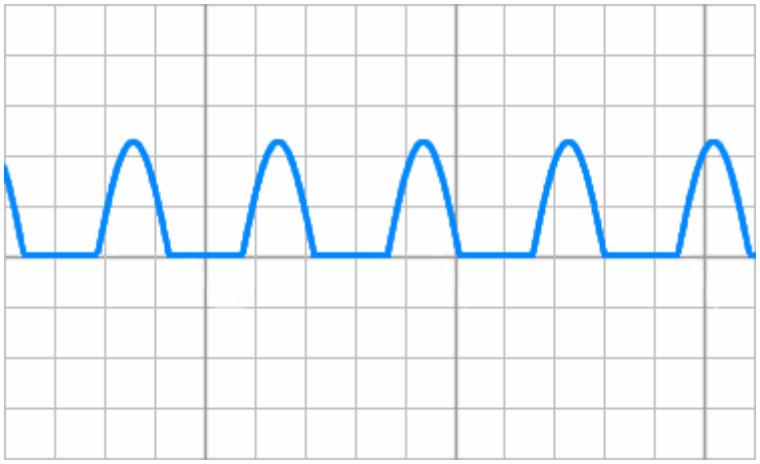


Results:

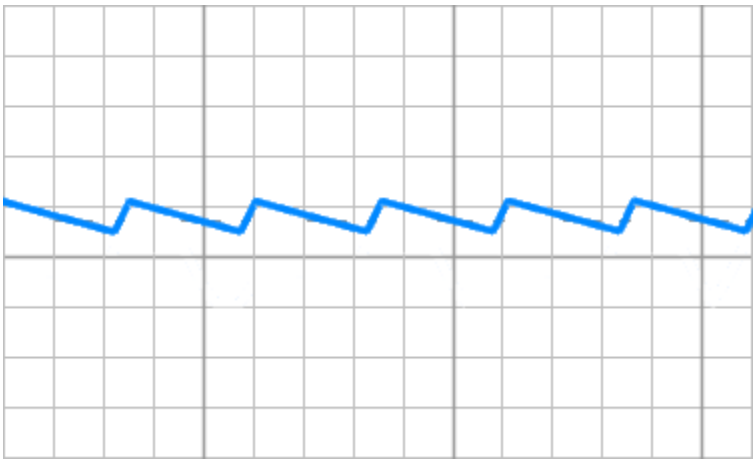
The input AC voltage at 200 Hz



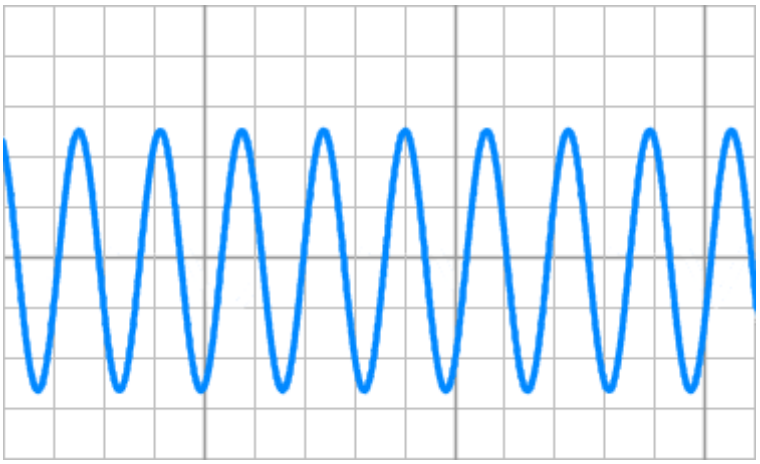
200 Hz, 1 μF capacitor



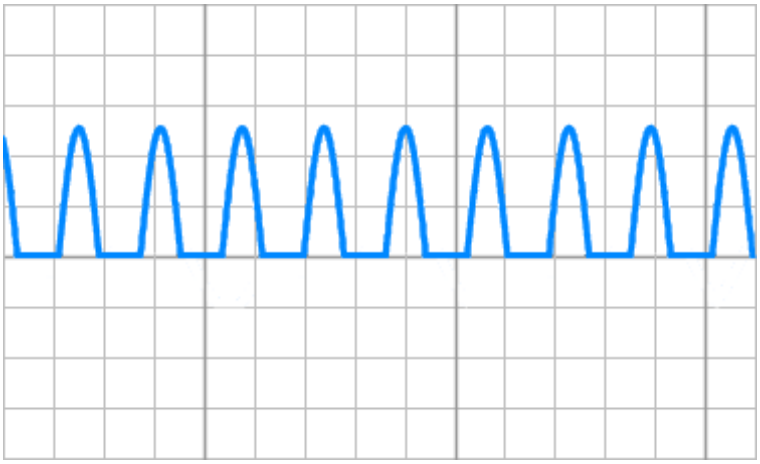
200 Hz, 10 μF capacitor



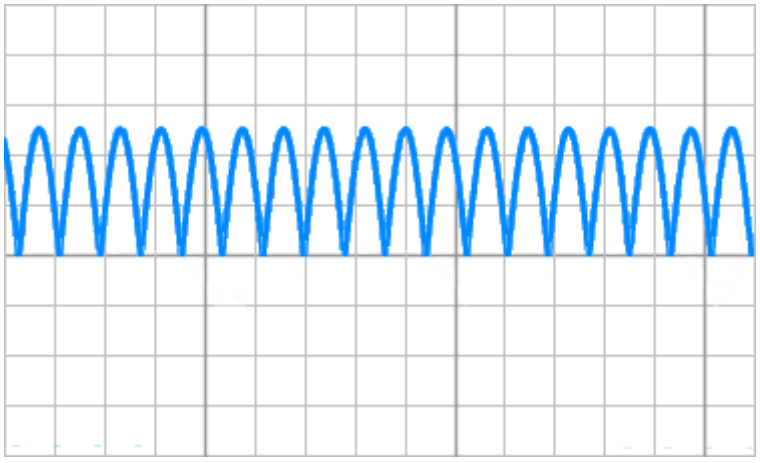
The input AC voltage at 2k Hz



2k Hz, 1 µF capacitor



2k Hz, 10 µF capacitor



These results show the input voltage for both 200 Hz and 2k Hz inputs, also shown are each of the four combinations that are made by using either a 1 µF capacitor or a 10 µF capacitor.

Interpretation:

The input at 200 Hz is a simple sinusoidal wave. The 2k Hz wave is similar to the 200 Hz one however since the Hz is higher it happens more. This is because Hz is equal is equal to $\frac{1}{t}$, where t is time. This means more repetitions of the wave happen for each unit time as the Hertz increase. This explains why the 200 Hz wave appears to be more stretched.

When using a 1 μF capacitor, the wave formed is only on one side, this is because the capacitor is a polarised capacitor meaning it only allows voltage to pass one way. This means when the AC voltage is negative, it allows it to pass through the circuit avoiding the 10k Ω resistor and making the potential difference (Voltage) between the scope 0.

The 10 μF capacitor does a similar thing but since it can hold 10 times more charge it needs more time to charge and dissipate its charge. The 200 Hz AC Voltage leaves it too much time to do dissipate and charge, as a result the wave looks very different, the time its charging represented by the voltage going up and the dissipation by the voltage going down.

At 2k Hz there is no issue but it can be seen how there are many skipped waves, these also represent when the capacitor is simultaneously charging and dissipating causing the voltage to be 0.