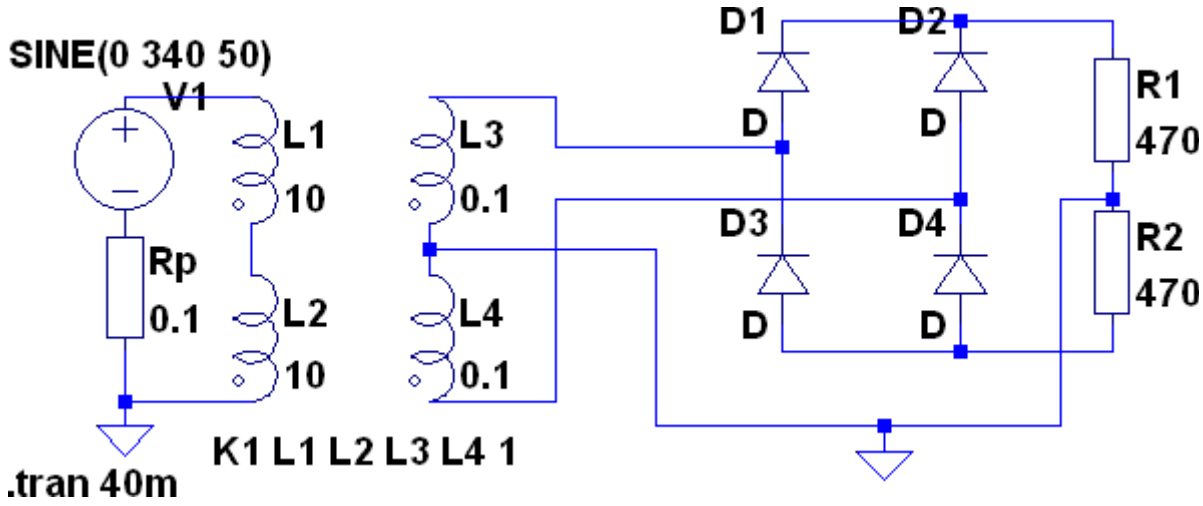
Single phase, uncontrolled rectification (conversion)



Instructions

Using the low voltage 24V AC supply in the lab construct the rectifier circuit above. The diodes can be found on the large perspex electronic experimenter boards. 3W (at least) resistors should be used.

Using a voltmeter measure the following.
AC voltage (both sides relative to centre tap). In the diagram above those are the voltages across L3 and L4.
The DC output voltage across R1 and R2
Use an oscilloscope to view the voltage across R1

Insert a small resistor (approx 1 ohm) in line between one of the low voltage AC terminals and the bridge rectifier. Use the oscilloscope to examine the waveform across this – it will be a scaled version of the current waveform.

Fit smoothing capacitors across R1 and R2 – these will be electrolytic so be careful to get them the right way around.

How has the current waveform changed (picture)
How has the output voltage waveform changed (picture)
Measure the DC output voltage (with a voltmeter)

Analysis

Calculate the theoretical un-smoothed output voltage and compare it with the measured value. Are there differences? If so, why?

The current waveform should change after you add capacitors. What are the implications of this from a supply perspective? What effect would larger and larger smoothing capacitors have?

What is the output ripple voltage (with the capacitors)?

Assuming the capacitor has to hold up the voltage for 10ms (a complete half cycle) and the current over this time is equal to the peak current, what is the calculated ripple voltage?