16.311 Electronics Lab.

Experiment

Rectifier Circuits

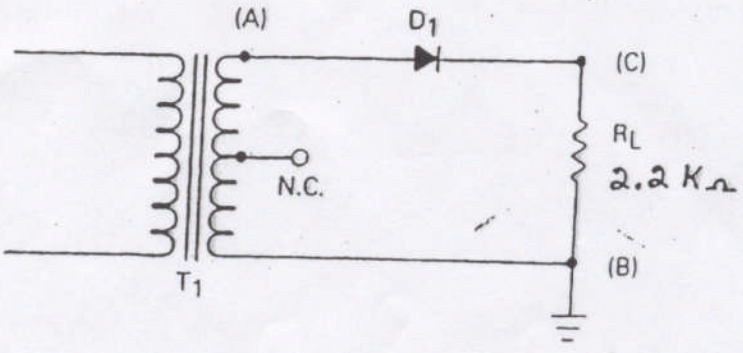
(This experiment will be used for the Formal Report)

Objective: To provide the opportunity to construct three type of rectifier circuits, the half-wave rectifier, the full-wave rectifier, and the full-wave bridge rectifier. Compare the input and output voltage signals of each, and as a function of time, and determine the DC component of the output waveform.

Materials Needed: four rectifier diodes, 1N4002 (or equivalent)
One 2.2k ohm resistor, four LED's (light emitting diode). one 200Ω resistor
One center tapped transformer with fused line cord.

CAUTION ! ***In this experiment you are instructed to connect a low-voltage ac transformer to the 120v. ac line. Be certain that you are using a properly fused and grounded transformer that has no exposed primary leads. At no time will you make a measurement on the primary side of the transformer.***

Procedure: Construct the half-wave circuit shown in fig. 1.



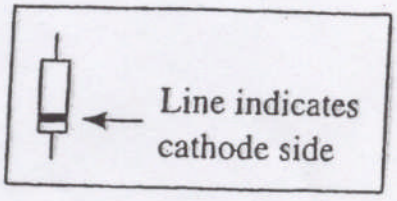
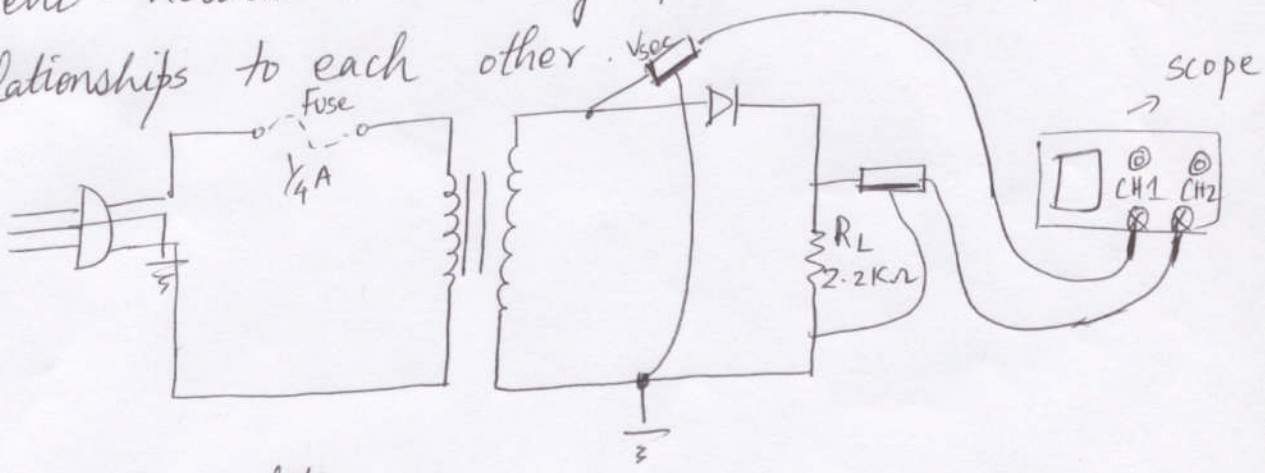


Figure 1

2. Measure the peak to peak voltage V_{sec} with the oscilloscope. Voltage should be set for line trigger sweep. Record the reading & Convert to RMS voltage.

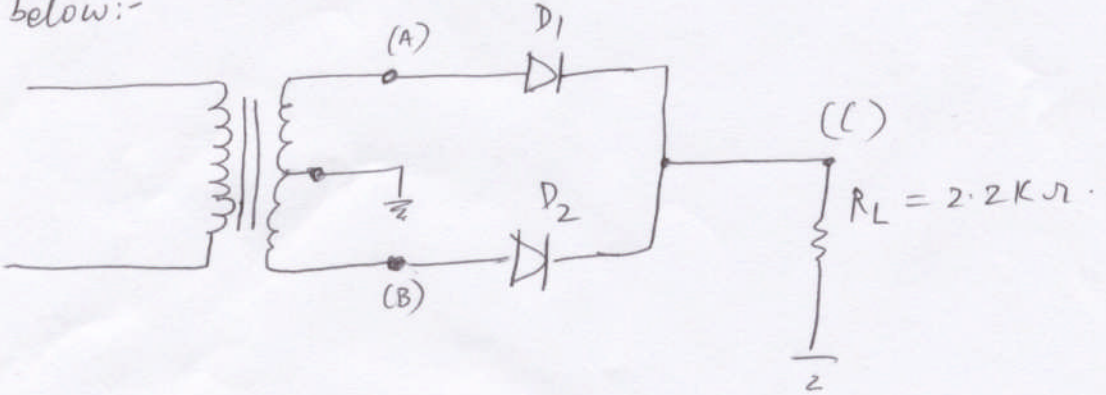
Voltage p-p	V_{RMS}

3. Measure the rectified voltage V_{load} with channel 2. The vertical should be in the d.c. mode for this measurement. Record the reading & draw the signal relationships to each other.



Part B. Full Wave rectifier:-

1. Construct the Full Wave Rectifier with 2 diodes shown below:-



4. Measure the peak - peak voltage V_{sec} with the oscilloscope using channel 1, The oscilloscope should be set for line trigger sweep. Record the reading and convert to voltage RMS.

5. Next measure the rectified voltage V_{load} with channel 2. The vertical should be in the dc mode for this measurement. Record the reading and draw the signal relationships to each other. See fig. 4

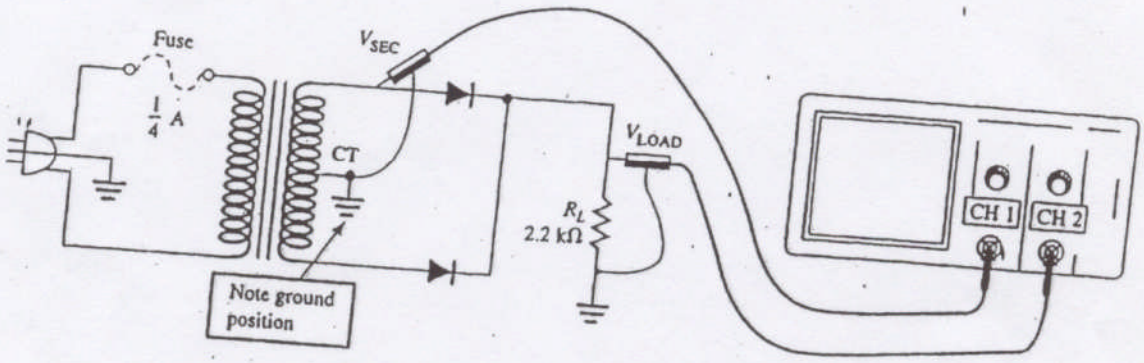


Figure 4

6. Construct the full-wave circuit shown in fig. 5. Using four diodes.

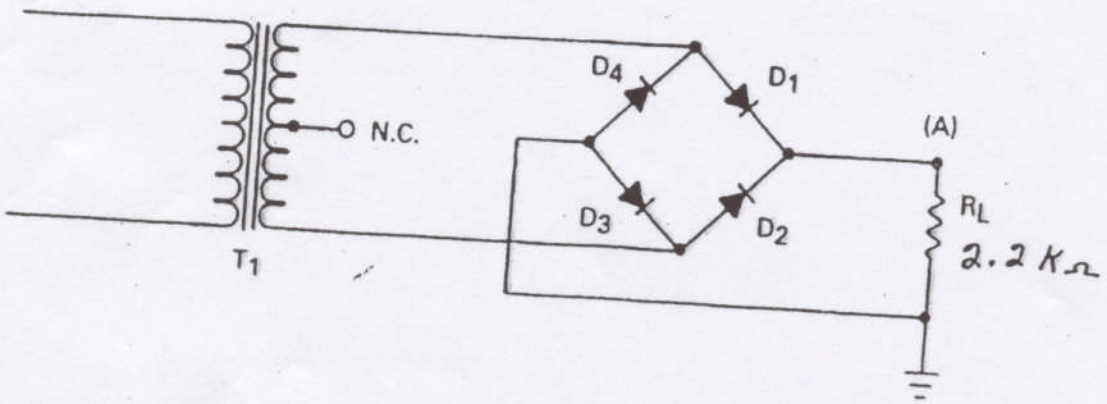


Figure 5

7. Measure the peak - peak voltage V_{sec} with the oscilloscope using channel 1, The oscilloscope should be set for line trigger sweep. Record the reading and convert to voltage RMS.

8. Next measure the rectified voltage V_{load} with channel 2. The vertical should be in the dc mode for this measurement. Record the reading and draw the signal relationships to each other. See fig. 6.

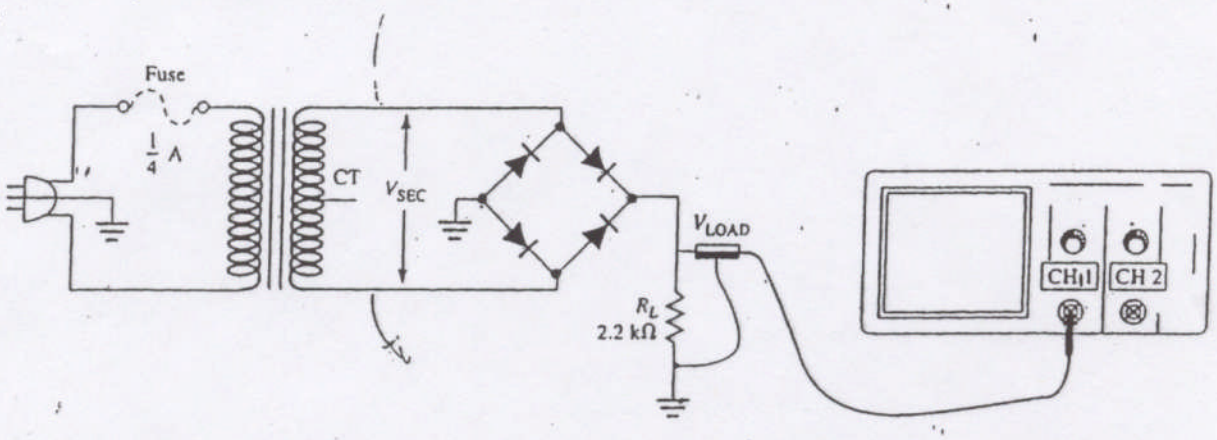


figure 6

9. In step 3 you moved the common reference point (gnd.) to the center tap of the transformer. If you wanted to look at the voltage across the entire secondary, you would need to connect the oscilloscope as shown in figure 7 and subtract channel 2 from channel 1. Why is it necessary to use two channels to view the entire secondary voltage ?

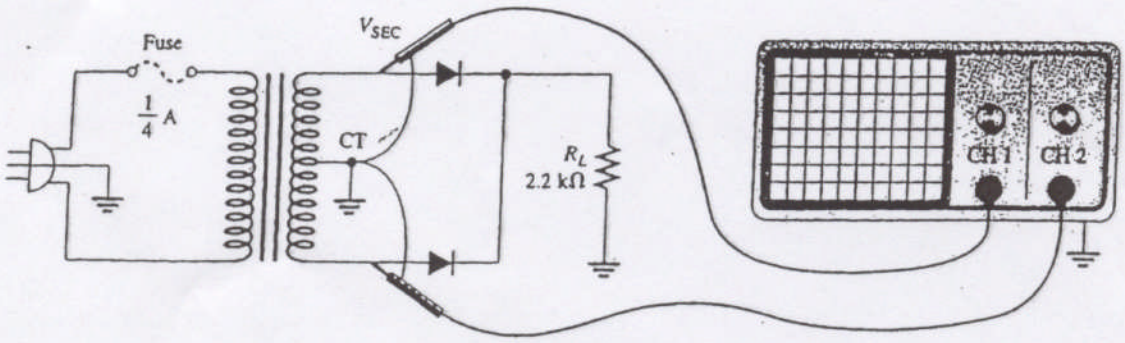
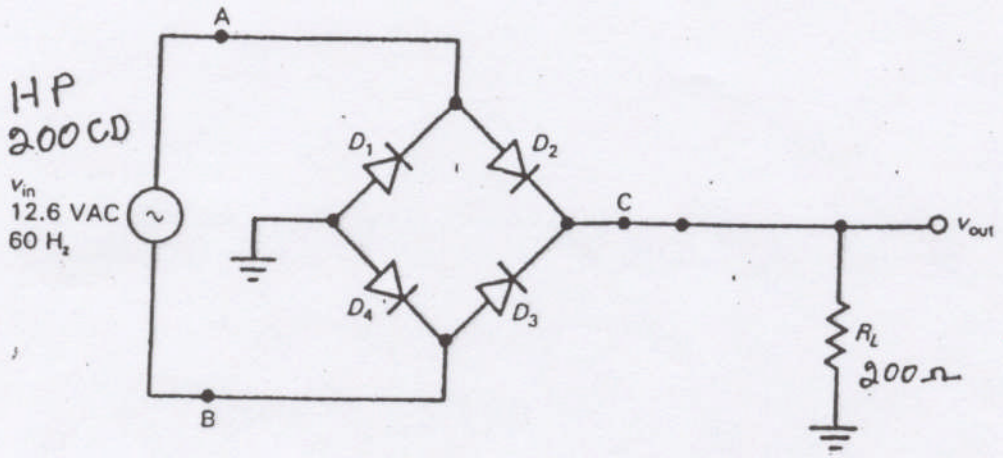


Figure 7

10. See the Light (optional , but fun and educational). Construct a full-wave rectifier with LED's and one 200 ohm resistor. See figure 8. Connect your bridge rectifier to the HP-200 sine-wave generator. Set the frequency at 60 Hz and a peak-peak voltage of ten volts. Connect the oscilloscope to check the waveforms. Now lower the frequency to about 5 Hz and watch the diodes conducting (diode forward bias gives light) This should complete your understanding of bridge rectifiers.



Full-wave Bridge Rectifier

Figure 8