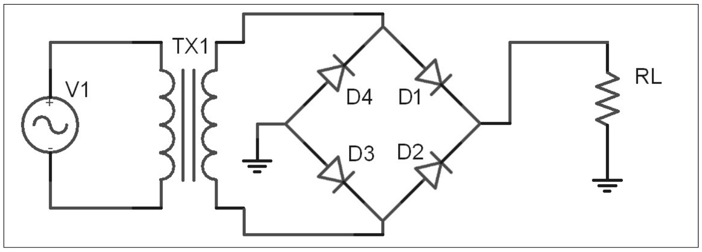
The most commonly used rectifier configuration requires four diodes in a "bridge" configuration, as shown below.



This configuration does not require a centre-tapped transformer (these are difficult to source). It also provides almost double the peak voltage seen with the centre-tapped transformer rectifier for the same turns ratio, and therefore provides almost four times the power.

Your instructor will explain how this circuit works. Mathematically, the calculations for average voltage, RMS voltage, and frequency are the same as for the centre-tapped transformer rectifier. However, the peak voltage across the load will be ***two*** diode drops down from the transformer secondary voltage.

Question: Using the same conditions and components as before -- 120 V_{AC} at 60 Hz, 8:1 transformer, barrier potential of 0.7 V, 220 Ω load resistor -- determine the following:

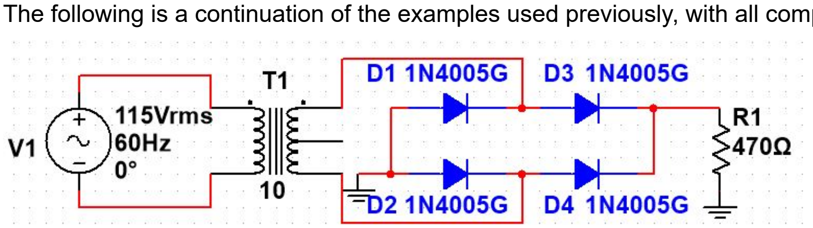
1. What is the peak voltage across the load resistor? 19.8 V_p
2. What is the frequency of the signal at the load? 120 Hz
3. What is the period of the signal at the load, in milliseconds? 8.33 ms
4. What is the average voltage across the load? 12.6 V_{DC}
5. What is the RMS voltage across the load? 14 V_{RMS}
6. What power will be dissipated as heat by the load resistor? 892 mW

As you can see, the power output for the same set of conditions is much higher for this rectifier than for either of the other configurations.

Also, the values for the Average and RMS voltages are much more similar than they were for the Half-Wave Rectifier, indicating that the output is closer to being true DC.

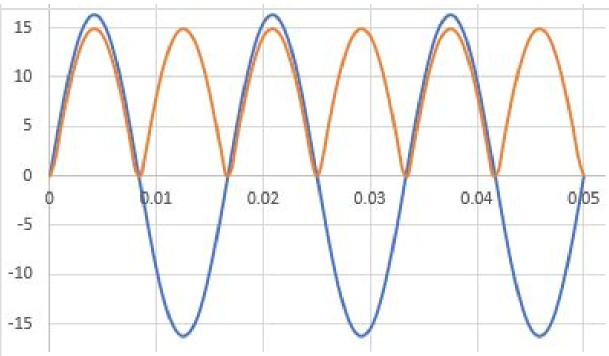
Worked Example

The following is a continuation of the examples used previously, with all components the same except the rectifier circuit.



- Since the current path always includes two diodes (D3 and D2 for the positive half-cycle, and D4 and D1 for the negative half-cycle), and since the orientation of the diodes is such that the current always flows through the resistor to ground, the peak voltage across the load is now the full secondary peak reduced by two diode drops: $V_R = (115 \cdot \sqrt{2}/10 - 2 \cdot 0.7 = 14.9\ V_p$.
- With the second half-cycle inverted, the result is a period of half a full cycle, or 8.33 ms; the frequency of the signal across the load is therefore 120 Hz.

The resulting signal, as compared to the signal across the secondary of the transformer, looks like this:



- The average voltage for a full-wave rectified signal can be predicted using $2*V_p/\pi$ = +9.46 V_{DC}
- The power-related voltage for a full-wave rectified signal can be predicted using $V_p/\sqrt{2}$ = 10.5 V_{RMS}
- The power dissipated by the resistor, from V_{RMS}^2/R = 235 mW