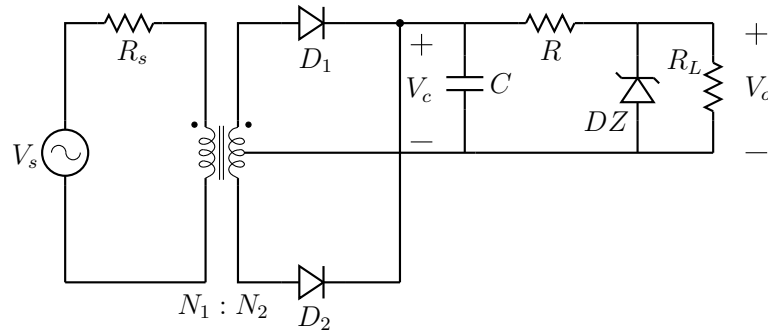


## rectifier\_tap\_2.sqproj



Shown in the figure is a centre-tapped full-wave diode rectifier with an output filter and a Zener-diode voltage regulator. The polarity of the diodes  $D_1$  and  $D_2$  ensures that the current through the load resistor always flows in the same direction for both positive and negative half cycles of the input voltage. The capacitor serves to hold the output voltage nearly constant. Finally, the Zener diode  $DZ$  provides a (smaller) constant output voltage to the load, irrespective of variations on the input side (provided a certain minimum current flows through  $DZ$ ).

### Exercise Set

1. For  $V_m = 169\text{ V}$ ,  $R_s = 0.5\ \Omega$ ,  $R = 190\ \Omega$ ,  $R_L = 200\ \Omega$ ,  $C = 520\ \mu\text{F}$ ,  $N_1 : N_2 = 14 : 2$ ,  $V_Z = 5\text{ V}$ .

Work out the following quantities analytically.

- (i) Average value of the capacitor voltage.
- (ii) Ripple voltage riding on the capacitor voltage.
- (iii) Average current through  $D_1$  and  $D_2$ .
- (iv) Peak current through  $D_1$  and  $D_2$ . (Assume the diodes to be ideal, with an on voltage of  $0\text{ V}$ ).
- (v) Maximum reverse voltage appearing across each of the diodes.
- (vi) Average current through the Zener diode.
- (vii) Ripple voltage at the output ( $V_o$ ). (Which circuit parameters control the magnitude of this ripple voltage?)

Verify your results with simulation.

2. Repeat 1 for  $C = 1000 \mu F$ .
3. How will the results change if the diode on voltage is  $0.7 V$ ?