28 Nov 2022

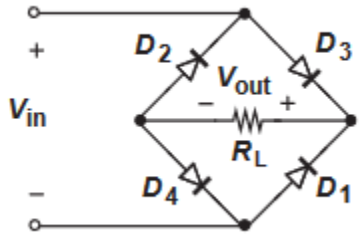
EE101 Tutorial 2

Topics: Rectifier Circuits

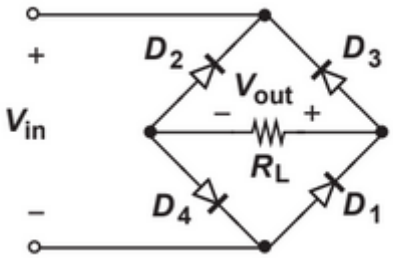
Q1. A 3V adapter using a half-wave rectifier must supply a current of 0.5A with a maximum ripple of 300 mV. For a frequency of 60Hz, compute the minimum required smoothing capacitor.

Q2. Assume the input and output grounds in full-wave rectifier are shorted together. Draw the output waveform with and without the load capacitor and explain why the circuit doesn't operate as a rectifier.

Q3. Plot the voltage across each diode in the figure shown below as a function of time if $V_{in} = V_o \sin \omega t$. Assume a constant-voltage diode model and $V_D > V_{D,\,on}$.



Q4. While constructing a full-wave rectifier as depicted below, a student mistakenly has swapped the terminals of D_3. Explain what happens. Use the exponential model.



Q5. A full-wave rectifier is driven by a sinusoidal input $V_{in} = V_0 \cos \omega t$, where $V_0 = 3V$ and $\omega = 2\pi(60Hz)$. Assuming $V_{D,on} = 800mV$, determine the ripple amplitude with a 1000-μF smoothing capacitor and a load resistance of 30 Ω.

Q6. Suppose the negative terminals of V_{in} and V_{out} in the figure below are shorted together. Plot the input-output characteristics assuming an ideal diode model and explaining why the circuit doesn't operate as full-wave rectifier.