National University of Computer & Emerging Sciences, Lahore
Department of Electrical Engineering (Fall 2023)

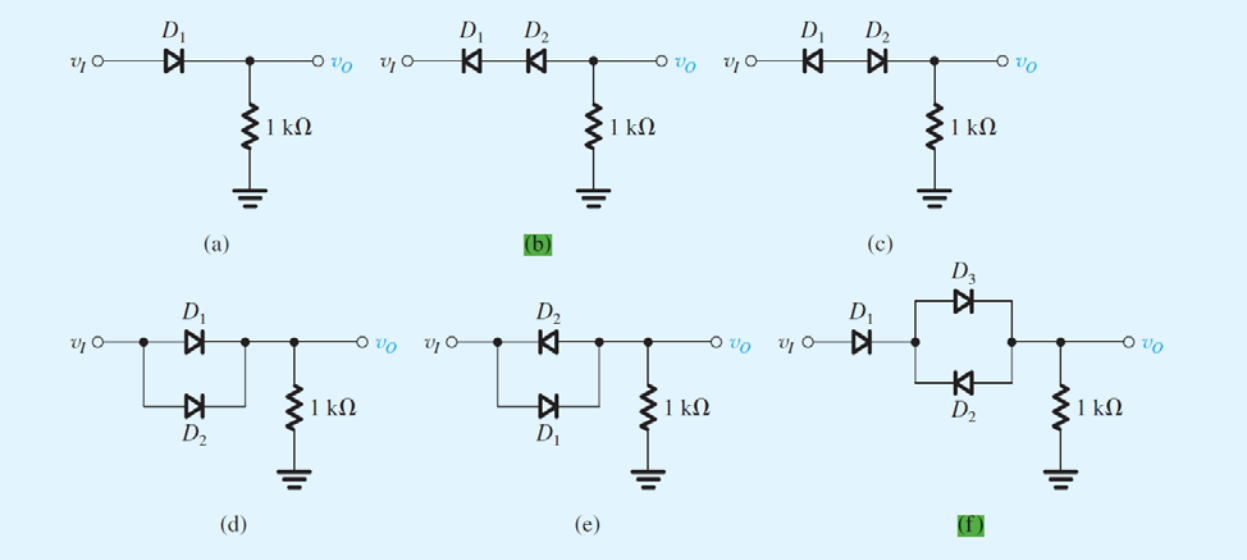
EE1004 – Electronic Devices & Circuits

Assignment#1 (CLO 1)

Section: All

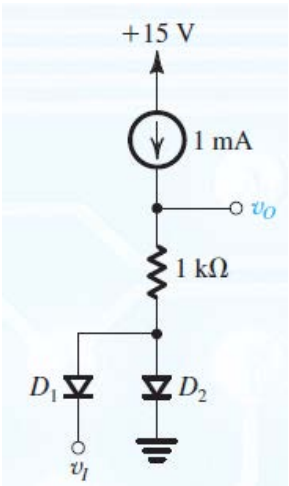
Question#1:

In the circuit given below, v_I is a 1-kHz, 10-V peak sine wave. Sketch the waveform resulting at v_O. What are its positive and negative peak values? Assume the diode behaves ideally.



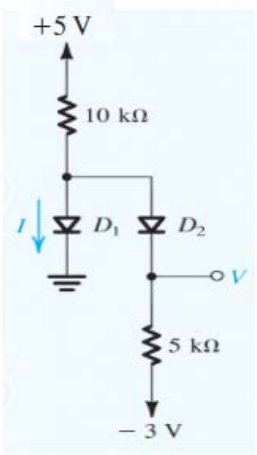
Question#2:

In the circuit given below, v_I is a 1-kHz, 10-V peak sine wave. Sketch the waveform resulting at v_O. What are its positive and negative peak values? Assume the diode behaves ideally.



Question#3:

Assuming that the diodes in the circuit given below are ideal, find the values of the labeled voltages and currents.



Question#4:

4.20 A particular diode is found to conduct 1 mA with a junction voltage of 0.7 V. What current will flow in this diode if the junction voltage is raised to 0.71 V? To 0.8 V? If the junction voltage is lowered to 0.69 V? To 0.6 V? What change in junction voltage will increase the diode current by a factor of 10?

Question#5:

Assuming the availability of diodes for which $v_D = 0.7$ V at $i_D = 1$ mA, design a circuit that utilizes four diodes connected in series, in series with a resistor R connected to a 10-V power supply. The voltage across the string of diodes is to be 3.0 V.

Question#6:

4.27 In the circuit shown in Fig. P4.27, D_1 has 10 times the junction area of D_2. What value of V results? To obtain a value for V of 60 mV, what current I_2 is needed?

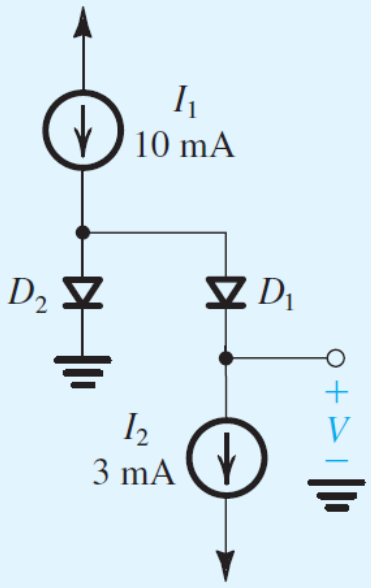


Figure P4.27

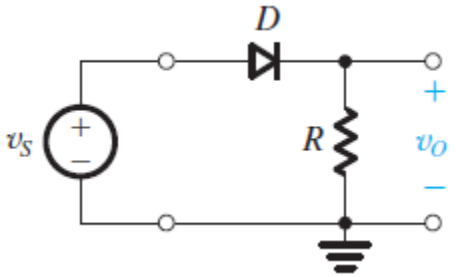
Question#7:

4.38 A diode operates in a series circuit with a resistance R and a dc source V. A designer, considering using a constant-voltage model, is uncertain whether to use 0.7 V or 0.6 V for V_D. For what value of V is the difference in the calculated values of current only 1%? For $V = 3$ V and $R = 1\ \text{k}\Omega$, what two current estimates would result from the use of the two values of V_D? What is their percentage difference?

Question#8:

Consider the half-wave rectifier circuit in figure below with the diode reversed. Let v_S be a sinusoid with 12-V peak amplitude, and let $R = 1.5$ kΩ.

Use the constant-voltage drop diode model with $V_D = 0.7$ V.
(a) Sketch the transfer characteristic.
(b) Sketch the waveform of v_o .
(c) Find the average value of v_o .
(d) Find the peak current in the diode.
(e) Find the PIV of the diode.



Question#9:

A full-wave rectifier circuit with a 1-kΩ load operates from a 120-V (rms) 60-Hz household supply through a 5-to-1 transformer having a center-tapped secondary winding. It uses two silicon diodes that can be modeled to have a 0.7-V drop for all currents. What is the peak voltage of the rectified output? For what fraction of a cycle does each diode conduct? What is the average output voltage? What is the average current in the load?

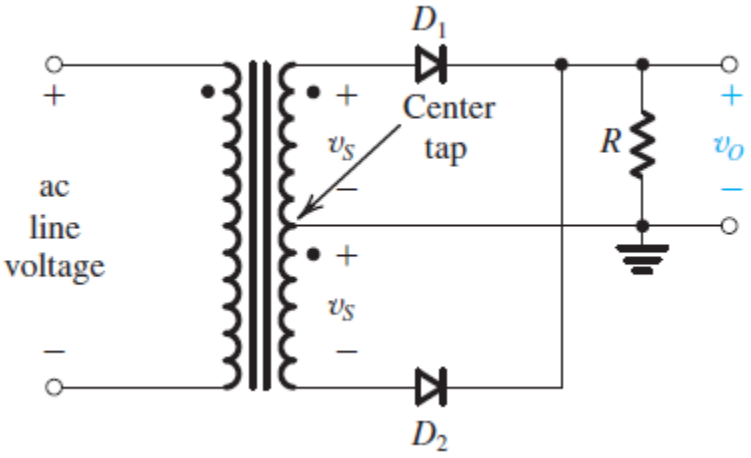
Question#10:

It is required to design a full-wave rectifier circuit using the circuit shown in figure below to provide an average output voltage of:

(a) 10 V

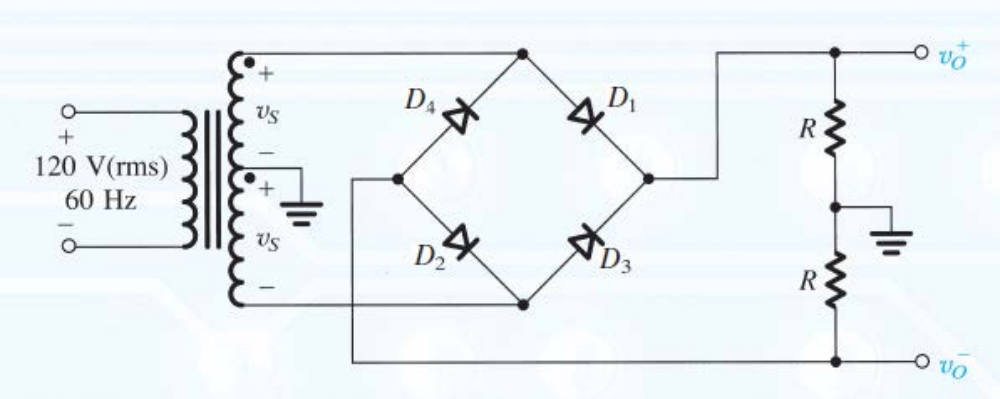
(b) 100 V

In each case find the required turn ratio of the transformer. Assume that a conducting diode has a voltage drop of 0.7 V. The ac line voltage is 120 V rms.

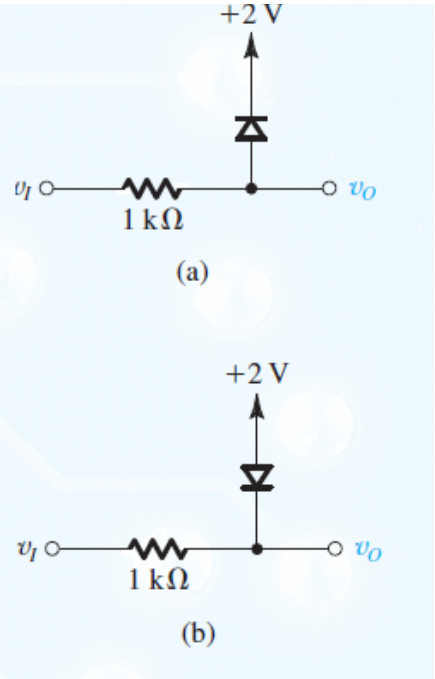


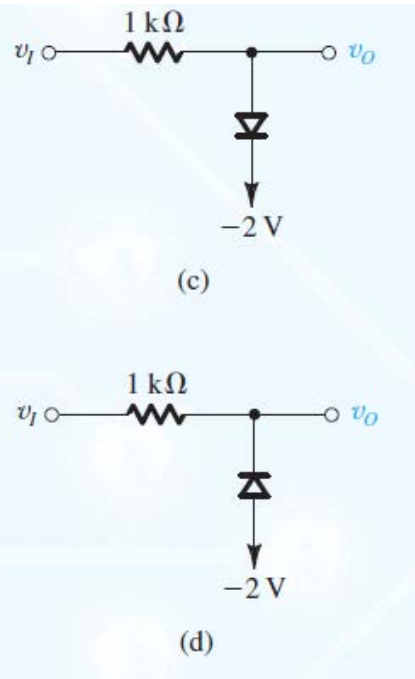
Question#11:

The circuit in the figure given below implements a complementary-output rectifier. Sketch and clearly label the waveforms of v_o^+ and v_o^-. Assume a 0.7-V drop across each conducting diode. If the magnitude of the average of each output is to be 15 V, find the required amplitude of the sine wave across the entire secondary winding. What is the PIV of each diode?



Question#12: Sketch the transfer characteristic v_O versus v_I for the limiter circuits shown in figure below. All diodes begin conducting at a forward voltage drop of 0.5 V and have voltage drops of 0.7 V when conducting a current $i_D \geq 1$mA.





Question#13: For the circuits in figure below, each utilizing an ideal diode (or diodes), sketch the output for the input shown. Label the most positive and most negative output levels. Assume $CR \gg T$.