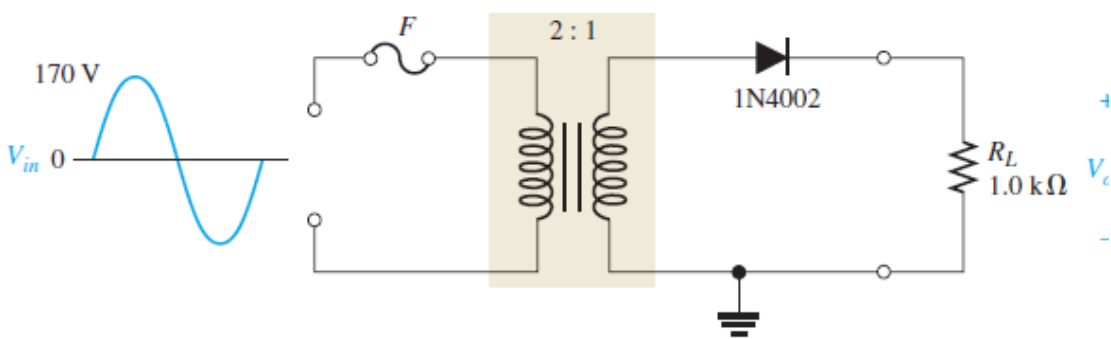


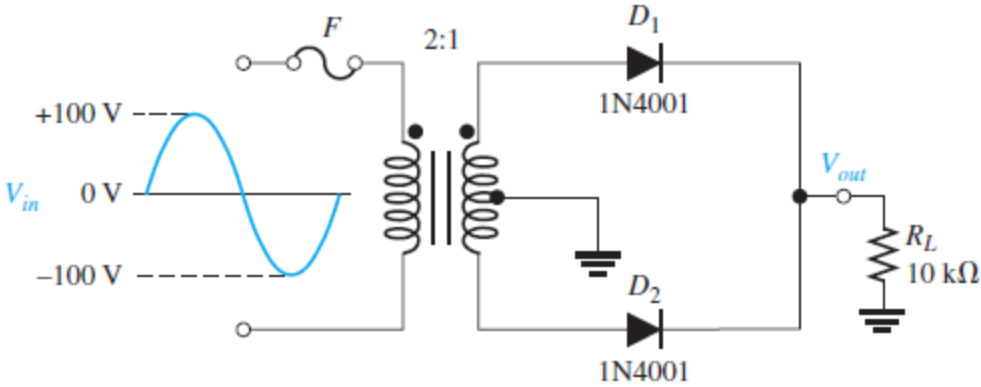
Electronic Circuits I - Tutorial 03

Diode Applications I

#	Question	
1	A diode can conduct current in two directions with equal ease.	F
2	When reverse-biased, a diode ideally appears as a short.	F
3	A basic half-wave rectifier consists of one diode.	T
4	The diode in a half-wave rectifier conducts for half the input cycle.	T
5	Each diode in a full-wave rectifier conducts for the entire input cycle.	F

MCQ1

#	Question	
1	When a diode is forward-biased and the bias voltage is increased, the forward current will (a) increase (b) decrease (c) not change	a
2	When a diode is reverse-biased and the bias voltage is increased, the reverse current (assuming the practical model) will (a) increase (b) decrease (c) not change	c
3	When a diode is forward-biased and the bias voltage is increased, the voltage across the diode (assuming the complete model) will (a) increase (b) decrease (c) not change	a
4	If the forward current in a diode is decreased, the diode voltage (assuming the complete model) will (a) increase (b) decrease (c) not change	b
5	If the input voltage in Figure 2–28 is increased, the peak inverse voltage across the diode will  (a) increase (b) decrease (c) not change	a

6	<p>If the frequency of the input voltage in Figure 2–36 is increased, the output voltage will</p>  <p>(a) increase (b) decrease (c) not change</p>	c
---	--	---

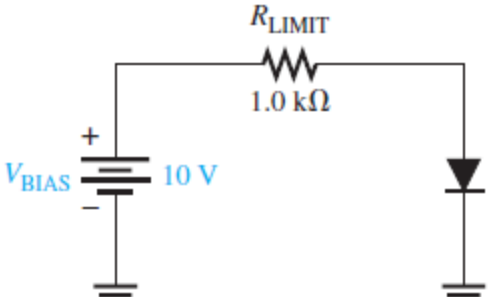
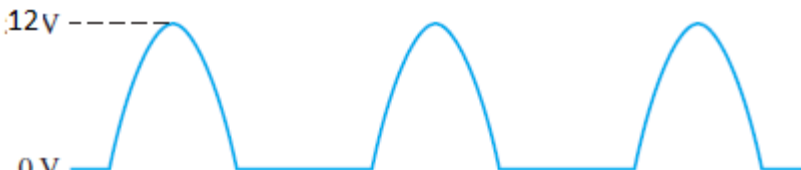
MCQ 2

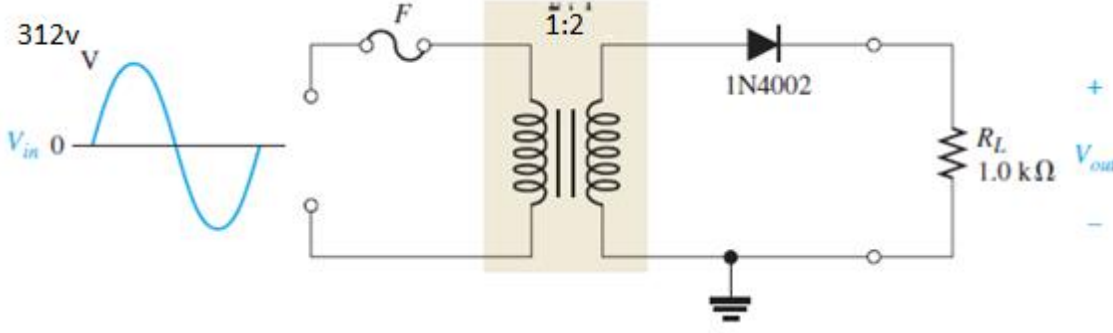
#	Question	Answer
1	<p>1. The term <i>bias</i> means</p> <p>(a) the ratio of majority carriers to minority carriers</p> <p>(b) the amount of current across a diode</p> <p>(c) a dc voltage is applied to control the operation of a device</p> <p>(d) neither (a), (b), nor (c)</p>	c
2	<p>When a diode is forward-biased,</p> <p>(a) the only current is hole current</p> <p>(b) the only current is electron current</p> <p>(c) the only current is produced by majority carriers</p> <p>(d) the current is produced by both holes and electrons</p>	d
3	<p>For a silicon diode, the value of the forward-bias voltage typically</p> <p>(a) must be greater than 0.3 V</p> <p>(b) must be greater than 0.7 V</p> <p>(c) depends on the width of the depletion region</p> <p>(d) depends on the concentration of majority carriers</p>	b
4	<p>A diode is normally operated in</p> <p>(a) reverse breakdown (b) the forward-bias region</p> <p>(c) the reverse-bias region (d) either (b) or (c)</p>	d
5	<p>The <i>V-I</i> curve for a diode shows</p> <p>(a) the voltage across the diode for a given current</p> <p>(b) the amount of current for a given bias voltage</p> <p>(c) the power dissipation</p> <p>(d) none of these</p>	a

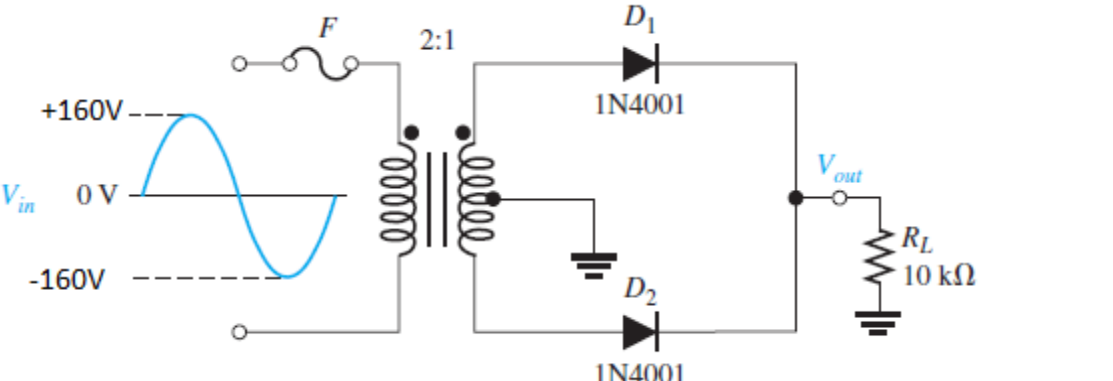


6	In the practical diode model, (a) the barrier potential is taken into account (b) the forward dynamic resistance is taken into account (c) none of these (d) both (a) and (b)	a
7	The average value of a half-wave rectified voltage with a peak value of 200 V is (a) 63.7 V (b) 127.2 V (c) 141 V (d) 0 V	a
8	The peak value of the input to a half-wave rectifier is 10 V. The approximate peak value of the output is (a) 10 V (b) 3.18 V (c) 10.7 V (d) 9.3 V	d
9	The average value of a full-wave rectified voltage with a peak value of 75 V is (a) 53 V (b) 47.8 V (c) 37.5 V (d) 23.9 V	b
10	The total secondary voltage in a center-tapped full-wave rectifier is 125 V rms. Neglecting the diode drop, the rms output voltage is (a) 125 V (b) 177 V (c) 100 V (d) 62.5 V	d

Problems

<p>Problem 1</p>	<p>Assume that the diode in Figure 2–18(a) fails open. What is the voltage across the diode and the voltage across the limiting resistor?</p> 
<p>Answer 1</p>	<p>$V_d=10V$, $V_{Rlimit}=0$;</p>
<p>Problem 2</p>	<p>Determine the average value of the half-wave voltage if its peak amplitude is 12 V.</p> 
<p>Answer 2</p>	<p>3.82 V</p>

<p>Problem 3</p>	<p>(a) Determine the peak value of the output voltage for Figure 2–28 if $n = 2$ and $V_{p(in)} = 312 \text{ V}$.</p> <p>(b) What is the PIV across the diode?</p> <p>(c) Describe the output voltage if the diode is turned around.</p> 
<p>Answer 3</p>	<p>(a) 623.3 V (b) 624 V (c) negative half-cycles rather than positive half cycles</p>

<p>Problem 4</p>	<p>What diode PIV rating is required to handle a peak input of 160 V in Figure 2–36?</p> 
<p>Answer 4</p>	<p>79.3 V including diode drop</p>



Faculty of Engineering

FACULTY OF ENGINEERING
AHRAM CANADIAN UNIVERSITY

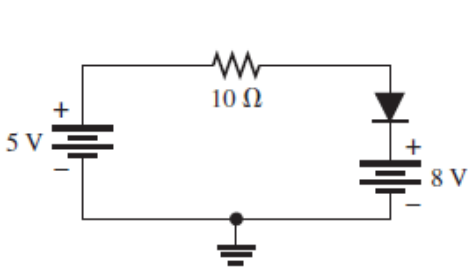
Q5	To forward-bias a diode, to which region must the positive terminal of a voltage source be connected?
Sol 5	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>p region</p> </div> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

Q6	Explain how to generate the forward-bias portion of the characteristic curve.
Sol 6	<p>.....</p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>To generate the forward bias portion of the characteristic curve, connect a voltage source across the diode for forward bias and place an ammeter in series with the diode and a voltmeter across the diode. Slowly increase the voltage from zero and plot the forward voltage versus the current.</p> </div> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

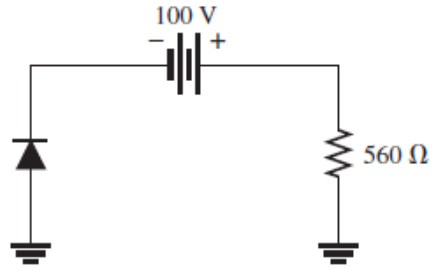


Q7

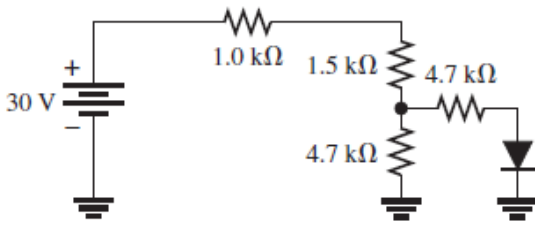
Determine whether each silicon diode in Figure is forward-biased or reverse-biased



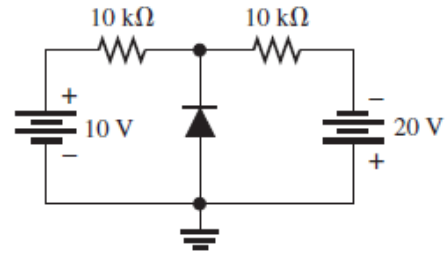
(a)



(b)



(c)



(d)

Sol 7

.....

(a) reversed-biased (b) forward-biased

.....

(c) forward-biased (d) forward-biased

.....

.....

.....

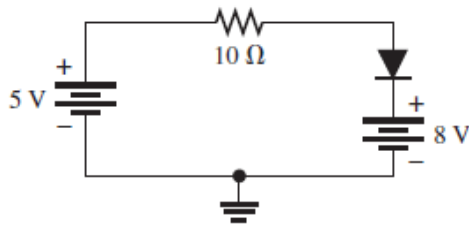
.....

.....

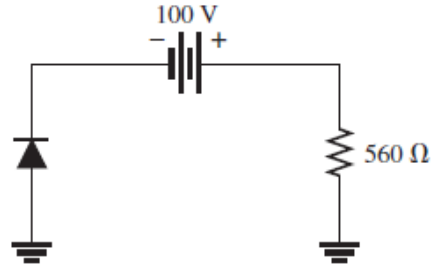
.....



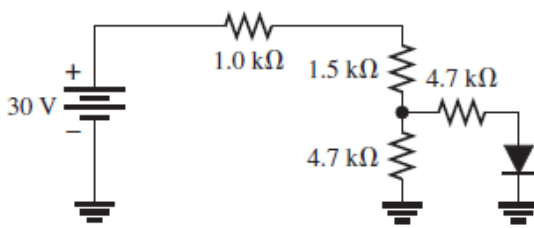
Q8 Determine the voltage across each diode in Figure , assuming an ideal diode



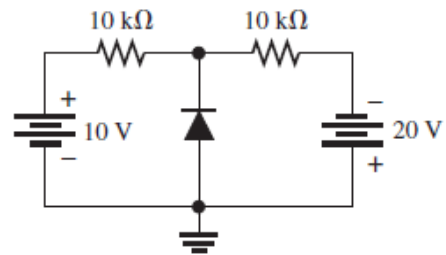
(a)



(b)



(c)



(d)

Sol
8

7. (a) -3 V (b) 0 V (c) 0 V (d) 0 V



Q9	<p>Draw the output voltage waveform for each circuit in Figure and include the voltage values</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="267 325 787 619"> <p>(a)</p> </div> <div data-bbox="836 325 1364 619"> <p>(b)</p> </div> </div>
Sol 9	<div style="display: flex; justify-content: space-around;"> <div data-bbox="267 661 844 1039"> <p>(a)</p> </div> <div data-bbox="860 661 1364 1039"> <p>(b)</p> </div> </div>

Q10	<p>Calculate the average value of a half-wave rectified voltage with a peak value of 200 V.</p>
Sol 10	<p>.....</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">63.7 V</div> <p>.....</p>

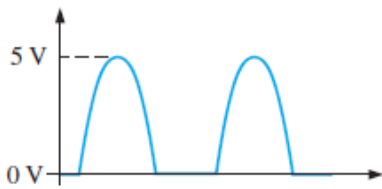
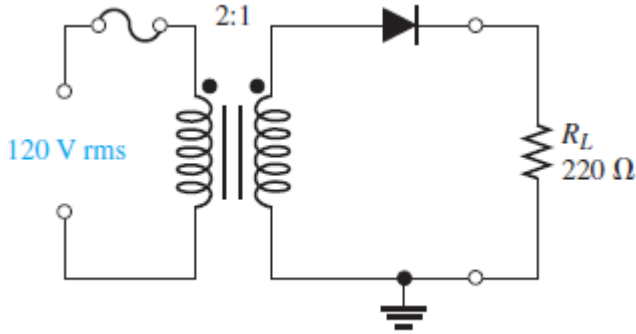


Faculty of Engineering

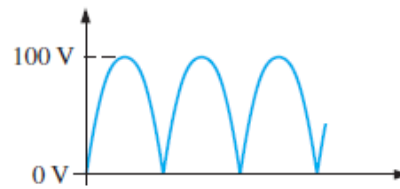
Q11	A power-supply transformer has a turns ratio of 5:1. What is the secondary voltage if the primary is connected to a 120 V rms source?
Sol 11	<p>.....</p> <p>..... 24 V rms</p> <p>.....</p> <p>.....</p>



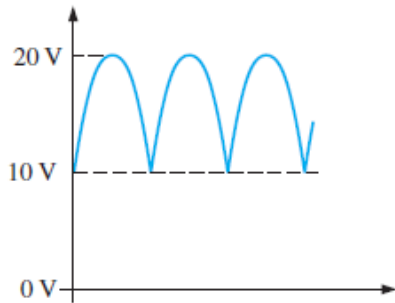
Q12 Find the average value of each voltage in Figure



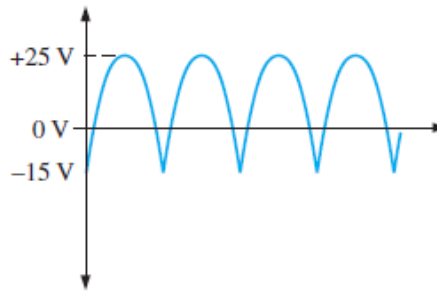
(a)



(b)



(c)



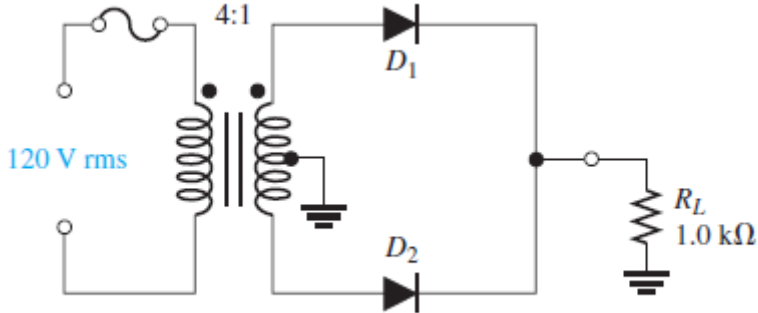
(d)

Sol
12

(a) 1.59 V (b) 63.7 V (c) 16.4 V (d) 10.5 V



Q13 Calculate the peak voltage across each half of a center-tapped transformer used in a full-wave rectifier that has an average output voltage of 120 V.



Sol
13

..... 186 V