



1. Consider a half-wave rectifier circuit of Figure 1 with 1kΩ load operates from a 220V (rms) 50Hz supply. If a capacitor chokes to provide a peak-to-peak ripple voltage of (i) 10% of the peak output and (ii) 1% of the peak output.

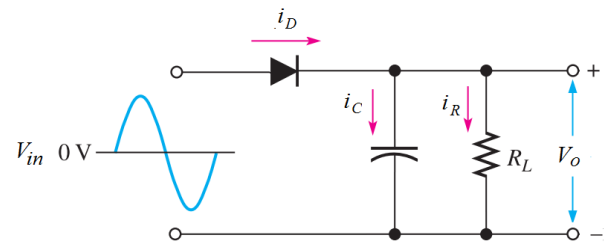


Figure 1

Find in each case:

- a) The value of the capacitor
 - b) The average output voltage?
 - c) Repeat the problem for full wave rectifier bridge.
2. What is the load regulation expressed as a percentage if the no-load output voltage of a regulator is 24.8V and the full-load output is 23.9V?
 3. Plot the voltage waveform across R_L for each circuit in Figure 2.

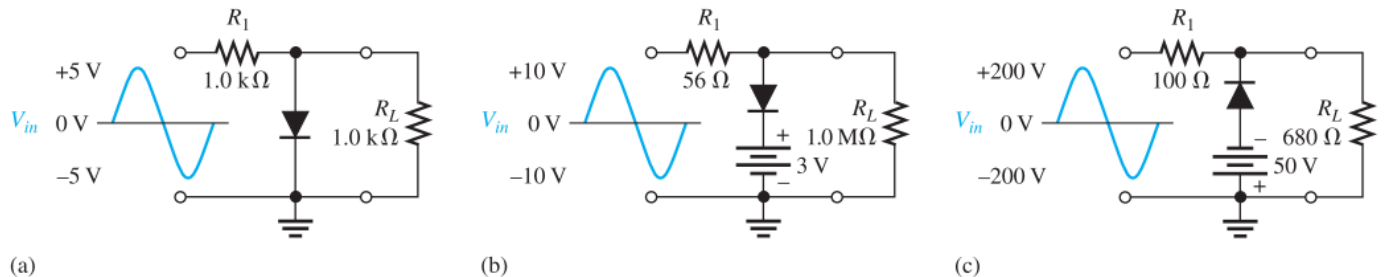


Figure 2

4. Plot the output waveform (v_{out}) for Figure 3.

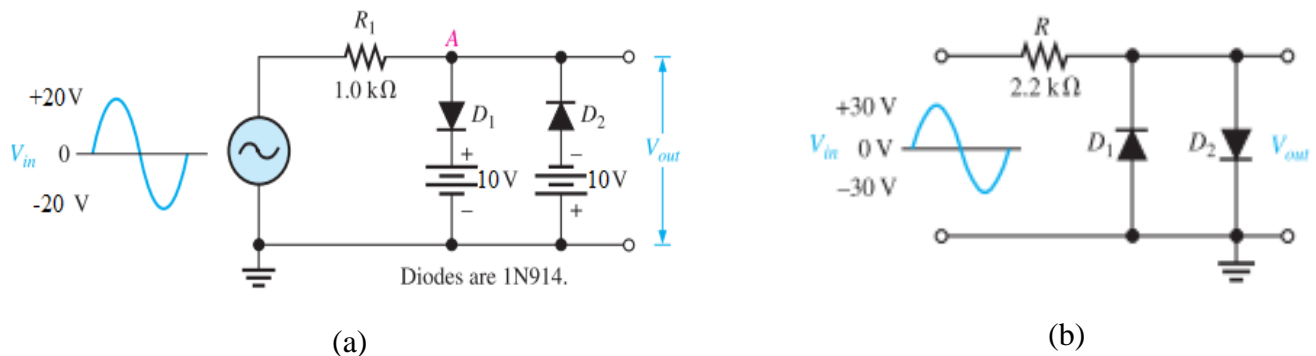


Figure 3



5. Sketch the transfer characteristics of the circuits in Figure 4

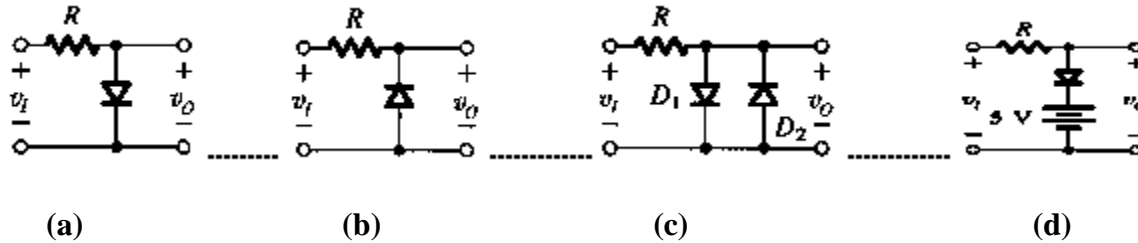


Figure 4

6. Assuming the diodes to be ideal, describe the transfer characteristic of the circuit shown in Figure 5

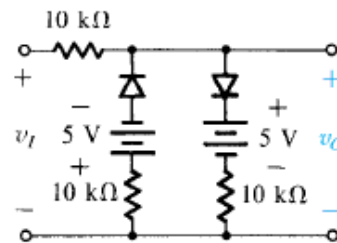


Figure 5

7. Determine the output voltage for the circuit in Figure 6.(a) for each input voltage in (b), (c), and (d).

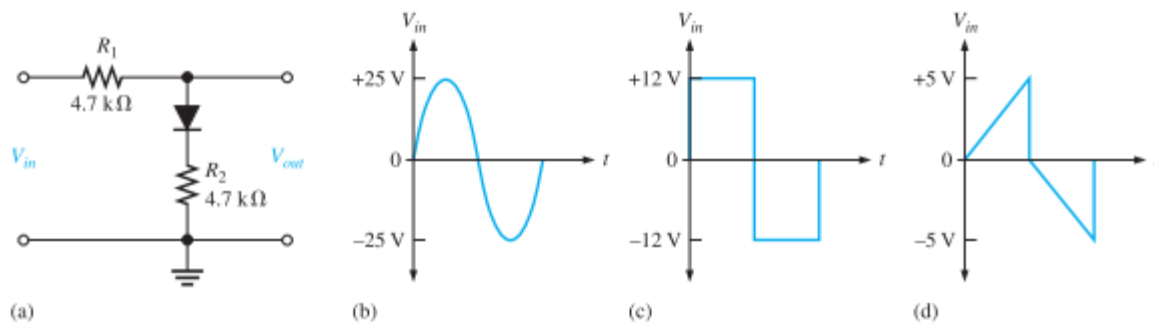


Figure 6

8. How would you change the voltage divider in Figure 7 to limit the output voltage to +6.7V?
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 What is the value of R_3 if the peak input voltage changed to 30V.

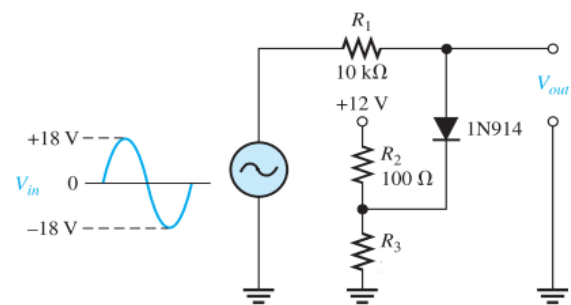


Figure 7



9. Describe the output waveform of each circuit in Figure 8. Assume the RC time constant is much greater than the period of the input voltage.

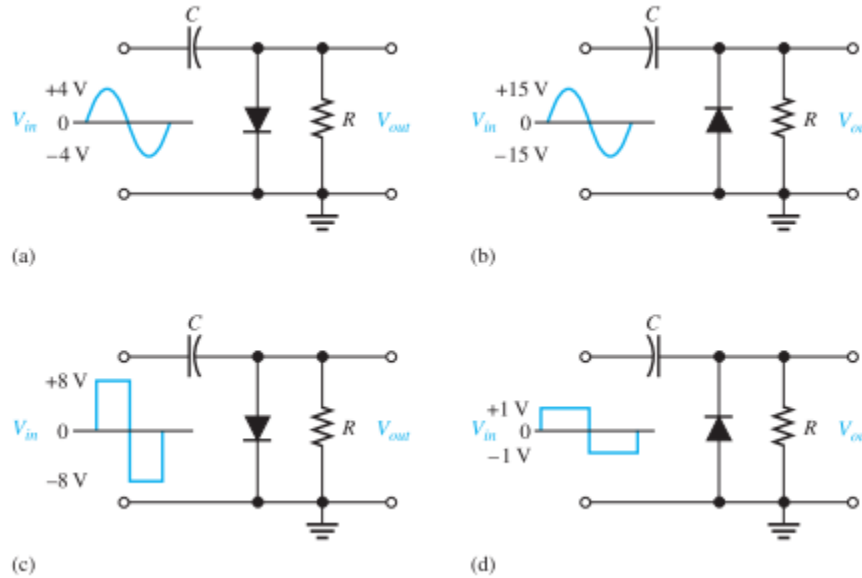


Figure 8

10. A certain voltage doubler has 20V rms on its input. What is the output voltage? Draw the circuit, indicating the output terminals and PIV rating for the diode.
11. Repeat Problem 10 for a voltage tripler and quadrupler.
12. Sketch the output voltage (v_o) of the gate of Figure 9(a) if the three signals of Figure 9(b) are impressed on the input terminals. Assume that diodes are ideal.

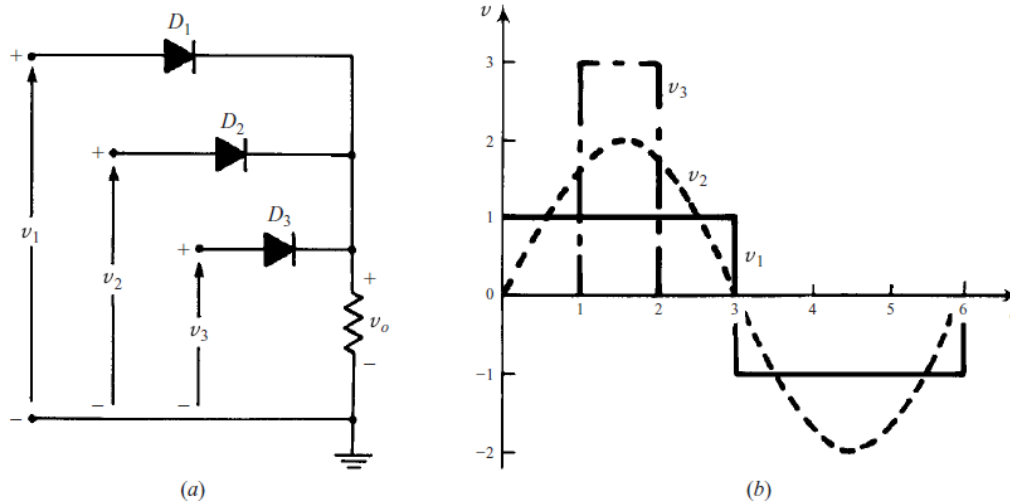


Figure 9



Design Problems

13. It is required to use a half wave rectifier to design a dc power supply that provides an average dc output voltage of 15 V on which a maximum of ± 1 V ripple is allowed. The rectifier feeds a load of 150 Ω . The rectifier is fed from the line voltage (220V rms, 50 Hz) through a transformer. The diodes available have 0.7-V drop when conducting.
- (a) Specify the rms voltage that must appear across the transformer secondary.
 - (b) Find the transformation ratio of the transformer
 - (c) Find the required value of the filter capacitor.
14. Repeat Problem 13 for the case in which the designer select a full-wave circuit utilizing a center-tapped transformer.
15. Repeat Problem 13 for the case in which the designer select a full-wave bridge rectifier circuit.