

Rectifier – Practice Problems

1. Draw the Circuit of a Half-Wave rectifier with load resistance and smoothing capacitor.
2. Draw the Circuit of a Full-Wave rectifier with load resistance and smoothing capacitor. Show which diodes will be ON during the positive and negative cycles of the input. (Note: Another name of full-wave rectifier is Bridge-Rectifier.)
3. Suppose, a sine-wave is input to a Half-Wave rectifier. What will be the waveform of the output-voltage? What will the waveform look like if a smoothing capacitor is added?
4. Suppose, a sine-wave is input to a Full-Wave rectifier. What will be the waveform of the output-voltage? What will the waveform look like if a smoothing capacitor is added?
5. Suppose, the wave $V_{in} = 10 \cos(1500\pi t + 3)$ is input to a Half-Wave rectifier with a load resistance of $15 \text{ k}\Omega$. Assume that the rectifier is made with a diode whose forward voltage drop is 0.6 V .
 - a. What is the peak value of the input?
 - b. What is the peak value of the output?
 - c. What is the frequency of the input waveform?
 - d. What is the DC Component/Average-Value of the output voltage?

Now, suppose a smoothing capacitor of $47 \mu\text{F}$ is connected in parallel with the load given above.

- e. What will be the frequency of the ripple that is formed?
- f. What is the peak-to-peak value of the ripple voltage?
- g. What is the rms-value of the ripple voltage?
- h. What is the DC-Component of the output after connecting the capacitor?
- i. What value of capacitor should we connect if we want a peak-to-peak ripple of 0.002V ?

Answers:

- a. 10; b. $(10-0.6)$; c. $(1500/2)$; d. $\left(\frac{10}{\pi} - \frac{0.6}{2}\right)$; e. $(1500/2)$; f. $\frac{10-0.6}{\left(\frac{1500}{2}\right) \cdot (15 \cdot 10^3) \cdot (47 \cdot 10^{-6})}$; g. $(\text{Value of 'f'})/2\sqrt{3}$;
h. $(10-0.6) - (\text{Value of 'f'})/2$; i. $4.17 \cdot 10^{-4} \text{ Farad}$