3.4) \[ V_D = 0.6 - 2 \times 10^{-3} \times (175 - 25) \]
\[ = 0.3 \text{V} \]

3.5)

(a)

(b)

(c) \[ -6.2 \text{V} \]
\[ 5.6 + 0.6 = 6.2 \text{V} \]
3.10) \[ V_{ss} = R_i V_0 + V_D \]

\[ i_D = \frac{V_{ss}}{R} - \frac{V_0}{R} = \frac{V_{ss}}{R} + (-\frac{1}{R}) V_0 \]

Thus slope of load line is \(-\frac{1}{R}\).

Since \(R\) does not change, slope will not change.

3.11)

3.15)

(a) Diode \(\to\) on \(V = 0\), \(I = \frac{10V}{2.7k\Omega} = 3.70\) mA

(b) Diode \(\to\) off \(I = 0\), \(V = 10V\)

(c) Diode \(\to\) on \(V = 0\), \(I = 0\)

(d) Diode \(\to\) on \(I = 5mA\), \(V = 5V\)
3.17)
(a) $V = 7.5V$, $I = 0$

(b)

<table>
<thead>
<tr>
<th>Vin</th>
<th>$D_1$</th>
<th>$D_2$</th>
<th>$D_3$</th>
<th>$D_4$</th>
<th>$V (V)$</th>
<th>$I (mA)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<tr>
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<td>on</td>
<td>on</td>
<td>off</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

3.22) Current through the meter is a half wave rectified sine wave with a peak amplitude of $(10V)^2 / R$. The average value of a half-wave rectified sine wave is its peak value divided by $\pi$.

\[
V_{avg} = \frac{1}{T} \int_{0}^{T} V(t)dt = \frac{1}{T} \left[ \int_{0}^{T/2} V_m \sin(\omega t)dt + \int_{T/2}^{T} (0)dt \right]
\]
\begin{align*}
\text{Peak value:} \\
I_0 &= \frac{2V_m}{2\pi} = \frac{V_m}{\pi} \\
\therefore \quad \frac{(10\sqrt{2})}{R} = 5\text{ mA} \quad R = 900\Omega
\end{align*}

\begin{align*}
\text{(t) only flows when } V_s(t) > V_B \text{ (Region A).} \\
\text{Peak current flows at the instant for which } V_s(t) \\
\text{attains its maximum value. The maximum current is} \\
I_{\text{max}} &= \frac{V_m - V_B}{R} = \frac{20 - 14}{10} = 0.6\text{ A} \\
\text{Current as a function of time is} \\
I(t) &= \frac{V_m \sin(\omega t) - V_B}{R} \quad \text{for } V_s > V_B \\
&= 0 \quad \text{for } V_s < V_B
\end{align*}
To determine the interval for which the diode is in the on state, we must solve this for the points at which \( i(t) = 0 \) \([\text{times } t_1 \text{ & } t_2]\):

\[
i(t) = 0 \Rightarrow \frac{V_m \sin(\omega t) - V_b}{R} = 20 \sin(\omega t) - 14
\]

\[
\sin(\omega t) = \frac{14}{20}
\]

\[
\omega t_1 = 0.775, \quad \omega t_2 = 2.37
\]

Period of the wave \( T = \frac{2\pi}{\omega} \)

\[
\therefore \text{ Diode on } = \frac{2.37/\omega - 0.775/\omega}{2\pi/\omega} \times 100\% = 25.3\%
\]