After being closed for a long time, the switch opens at \( t = 0 \).

Given the capacitor connected as shown in the box and using not more than one each \( R \) and \( L \), design a circuit to go in the dashed-line box that will produce the \( |H(j\omega)| \) vs. \( \omega \) shown above, that is:

\[
|H(j\omega)| = \frac{2}{3} \text{ at } \omega = 0
\]

\[
|H(j\omega)| = 1 \text{ at } \omega_0 = 1 \text{ M rad/s}
\]

\[
|H(j\omega)| = \frac{2}{3} \text{ as } \omega \to \infty
\]
One period, $T$, of a function $v(t)$ is shown above. The formula for $v(t)$ is

$$v(t) = \begin{cases} 
-16V & 0 < t < T/4 \\
8V & T/4 < t < 3T/4 \\
0V & 3T/4 < t < T 
\end{cases}$$

Find the numerical value of the following coefficients of the Fourier series for $v(t)$:

2. $a_v$

3. $a_1$

4. a) $a_2$
   b) $b_1$
Write the time-domain expression of the second harmonic (i.e., $k = 2$) of $v_o(t)$.

**Note:** $\omega_0 = 3$ rad/s.