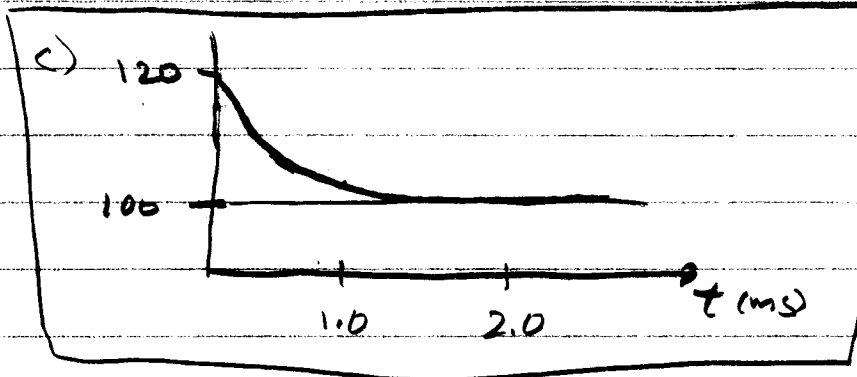


Answers to Final Exam - Section 3

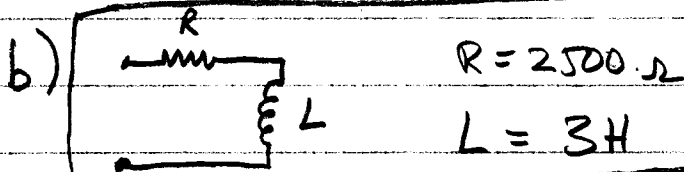
1. $V_{Th} = 1V$ $R_{Th} = 250\Omega$

2. a) $V_1 = 1.0667V$ b) $V_0 = 6V$

3. a) $V_c(0) = 120V$ b) $V_c(t) = 100 + 20e^{-t/5 \times 10^{-4}}$



4. a) $Z_T = 2500 + 1500j$



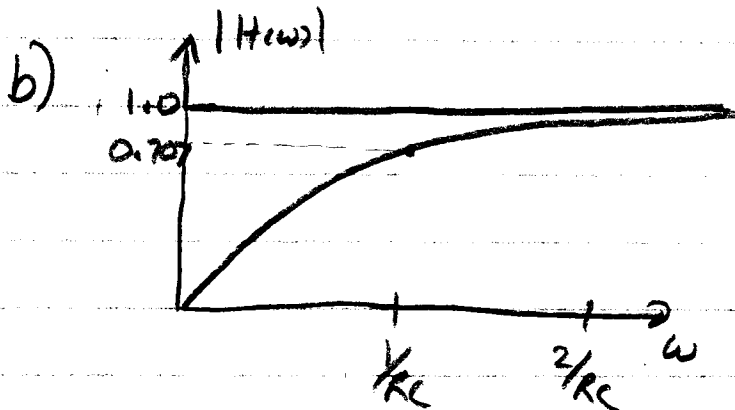
c) $i(t) = 6.86 \times 10^{-4} \cos(500t - 30.96^\circ)$

5. a) $F_s = 2f = 3183$ samples/s (to prevent aliasing)

b) $0.001 = \frac{50}{2^N} \Rightarrow N = \frac{\log(50 \times 10^3)}{\log(2)} = 15.6$ bits

6. a)

$$H(\omega) = \frac{j\omega CR}{1 + j\omega CR}$$



c)

For example, $C = 1 \text{ nF}$
 $R = 33.3 \text{ k}\Omega$

d) With $C = 1 \text{ nF}$, $R = 33.3 \text{ k}\Omega$

$$V_{\text{out}}(t) = 3.2 \cos(25000t + 20.2^\circ) + 4.998 \cos(10^6t + 1.72^\circ)$$

For $C = 0.5 \mu\text{F}$, $R = 100 \text{ k}\Omega$ ($\omega_c = 20 \text{ rad/s}$)

$$V_{\text{out}}(t) = 5.00 \cos(2500t + 0.46^\circ) + 5 \cos(10^6t)$$

Extra credit:

For example:

