April 19, 2015, Final Exam

Answers

1) $\begin{bmatrix} 0.0018 & -0.0010 \\ -0.0310 & 0.0011 \end{bmatrix}\begin{bmatrix} V_A \\ V_B \end{bmatrix} = \begin{bmatrix} 0.0060 \\ 0 \end{bmatrix} \Longrightarrow V_o = V_B = -6.428\ \text{V}$

2) $v_o = -2\ \text{V}$

3) a) $V_{th} = 24\ \text{V},\ R_{th} = 8\Omega$

b) $C_T = 40\ \mu\text{F}$

c) $v_C(t) = 24e^{-t/1.8\times10^{-3}}\ \text{V}$

d) $v_C(4\times10^{-3}\ \text{s}) = 2.6\ \text{V}$

4) a) $i_o(t) = 0.2121\ \cos(8000t + 45°)$

b) $P = \mathcal{R}e\left(\frac{1}{2}\underline{V}\ \underline{I^*}\right) = 0.225\ \text{W}$

5) a) High-pass filter

b) $R_1 = 100\ k\Omega, R_2 = 500\ k\Omega$

c) $v_o(0.3) = 4.31\ \text{V},\ v_o(1.0) = 10.6\ \text{V}, v_o(2.0) = 13.4\ \text{V};\ v_o = 0$ at all other frequencies.

Extra Credit: $\omega = {}^{1}/_{\sqrt{LC}}$