

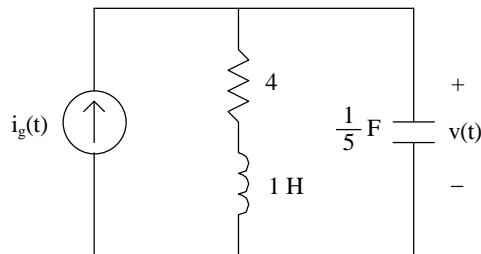
Homework Assignment #2

Reading Assignment:

Ch. 13, Sect. 1-5, 7 in *Electric Circuits, 8th Edition* by Nilsson
 Ch. 4, Sect. 4 in *Linear Signals & Systems, 2nd Ed.* by Lathi
 Handout: Laplace Transform Properties and Common Laplace Transform Pairs
 Lecture notes

Problem Assignment:

- 1) Work the following problems from Ch. 13 of *Electric Circuits, 8th Edition* by Nilsson: 9, 10, 13, 27(a & c only), 44, 49, 55a, 69a (find $H(s)$ then the impulse response, $h(t)$)
- 2) Use Laplace transforms to solve problem 7.81 of *Electric Circuits, 8th Edition* by Nilsson.
- 3) Work problem 4.4-7 in *Linear Signals & Systems, 2nd Ed.* by Lathi:
- 4) A) Determine the transfer function $H(s) = V(s)/I_g(s)$ for the circuit shown below.
 B) Determine the impulse response [i.e., find $v(t)$ if $i_g(t) = \delta(t)$ A].
 C) Determine the unit step response [i.e., find $v(t)$ if $i_g(t) = u(t)$ A].



Selected Answers:

- 13.13) a) $i_L(0^-) = 5A$, $v_C(0^-) = 150V$ b) $V_o(s) = -50/(s + 20,000)$ c) $v_o(t) = -50e^{-20,000t}u(t)$ V
 13.17) $v_o(t) = [-45te^{-5t} + 24e^{-5t}]u(t)$ V
 13.44) $v_o(t) = e^{-10,000t} \cos(20,000t + 90^\circ)u(t)$ V = $-e^{-10,000t} \sin(20,000t)u(t)$ V
 13.51) a) $H(s) = \frac{-15,625s}{s^2 + 10,000s + 125 \cdot 10^6}$
 b) $z_1 = 0$, $p_1 = -5000 + j10000$, $p_2 = -5000 - j10000$
 13.55a) $H(s) = \frac{I_o(s)}{I_g(s)} = \frac{2000s}{s^2 + 2000s + 10^7}$
 13.69) a) $H(s) = \frac{0.2}{s+1}$, $h(t) = 0.2e^{-t}u(t)$
 7.81) $v_o(t) = 40e^{-100t}u(t) - 40e^{-100(t-0.006)}u(t-0.006)$ V
 4.4-7) $y(t) = e^{-2t} [1.5\cos(3t) - 5/6\sin(3t)]u(t)$ V = $1.716e^{-2t} \cos(3t + 29.1^\circ)u(t)$ V
 3) a) $H(s) = \frac{V(s)}{I_g(s)} = \frac{5s + 20}{s^2 + 4s + 5}$
 b) $v(t) = h(t) = e^{-2t} [5\cos t + 10\sin t]u(t)$ V
 c) $v(t) = 4 - e^{-2t} [4\cos t + 3\sin t]u(t)$ V