



Bonjour! Obtenez
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*University ☺ of P ☺ ortland
Sch ☺ ol ☺ of Engineering*

EE 262-Signals & Systems-3 cr. hrs.
Spring 2017

Midterm Exam # 2

(Prepared by Professor A. S. Inan)

(Wednesday, April 12, 2017)

(Closed Book Exam, 3 formula sheets allowed.)

(Total Time: 55 mins.)

(Any 6 of 10 problems in-class, other 4 take-home!)

Name: _____ ☺

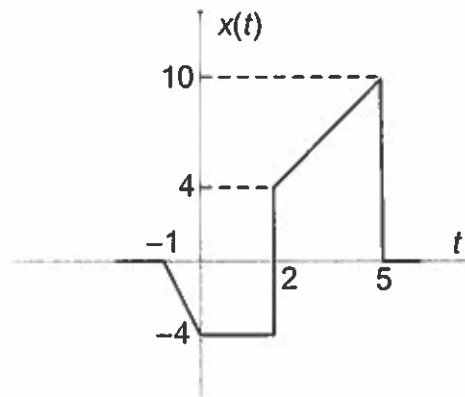
Signature: _____ ☺

(1)(10 points) **Unilateral Laplace transform.** Find the unilateral Laplace transform of the signal given by

$$x(t) = 4e^{-2t+3}u(t-2) * [2e^{-t}u(t-2) * 3\delta(t-2)]$$

(Note that this is a convolution problem. Provide your answer in its simplest form.)

(2)(10 points) **Unilateral Laplace transform.** Find the unilateral Laplace transform of the signal $x(t)$ as shown.



(3)(10 points) **Inverse Laplace transform.** Find the inverse Laplace transform of the signal given by

$$X(s) = \frac{2e^{-2s}(s+2)}{s(s^2+2)}$$

(4)(10 points) **Transfer function and impulse response.** When excited by a unit-step function $u(t)$ at zero state, the response of a system is given by

$$y(t) = 20t^2 e^{-2t} u(t)$$

Determine (a) the system transfer function; (b) the impulse response.

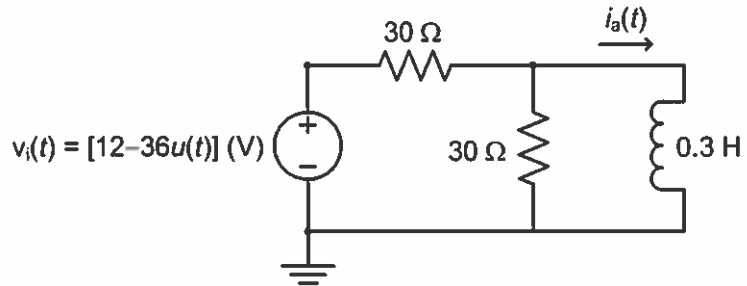
(5)(10 points) **Unilateral Laplace transform.** Given $x(t) \leftrightarrow X(s)$ unilateral Laplace transform pair and given the signal $y(t)$ to be

$$y(t) = 17e^{(s-2t)} x\left(\frac{3t-6}{4}\right), \text{ express } Y(s) \text{ in terms of } X(s).$$

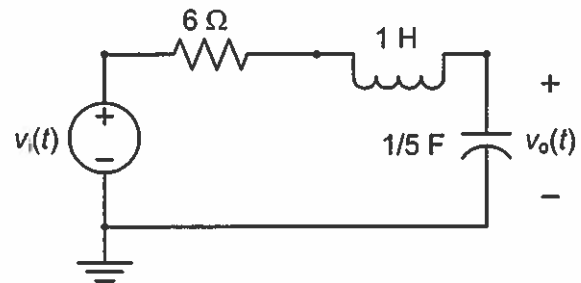
(6)(10 points) **Initial and final values.** Determine the initial and final values of $x(t)$ if the unilateral Laplace transform of $x(t)$ is given by

$$X(s) = \frac{6s^4 + 11s^3 - 5s + 9}{2s^5 + 47s^4 + 3s^3 + 18s^2 - 10s}$$

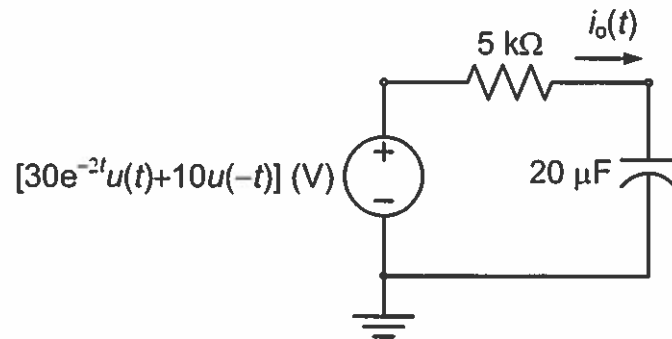
- (7)(10 points) **Application of Laplace transform to electric circuits.**
 For the electric circuit shown, use Laplace transform to find the current signal $i_a(t)$ for $t > 0$.



- (8)(10 points) **Transfer function and impulse response.** Find the transfer function and the impulse response of the electric circuit shown.



- (9)(10 points) **Application of Laplace transform to electric circuits.**
For the electric circuit shown, use Laplace transform to find the current signal $i_o(t)$ for $t \geq 0$.



- (10) (10 points) **Inverse Laplace transform.** Find the inverse Laplace transform of the signal given by

$$X(s) = \frac{4(2s^2 + 9s + 10)}{(s+1)(s+3)^2}$$