University ☺f P☺rtland
Sch☺☺l ☺f Engineering

EE 262-δignals & δystems-3 cr. hrs.
Spring 2014

Midterm Exam # 2

(Prepared by Professor A. S. Inan)

(Friday, April 4, 2014)
(Closed Book Exam, 3 formula sheets allowed.)
(Total Time: 55 mins.)
(Any 6 of 10 problems in-class, other 4 take-home!)

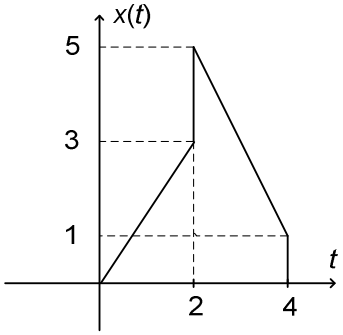
Name:_____ ☺

Signature:_____ ☺

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

$$x(t) = \frac{d}{dt}\left\{3e^{-2t+1}u(t-4)\right\}$$

(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

$$X(s) = \frac{(s+5)e^{-3(s-1)}}{6s^2+4s}$$

(4) (10 points) **Inverse Laplace transform.** Find the inverse Laplace transform of the signal given by

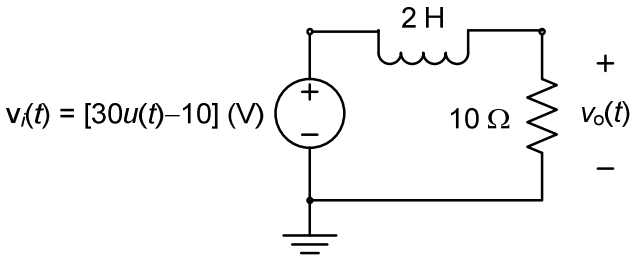
$$X(s)=\frac{2s^2+5}{s^2+4s+13}$$

(5) (10 points) **Unilateral Laplace transform.** Given $x(t)\leftrightarrow X(s)$ unilateral Laplace transform pair and given the signal $y(t)$ to be $y(t)=2e^{-2(t-3)}x(3(t-2))$, express $Y(s)$ in terms of $X(s)$.

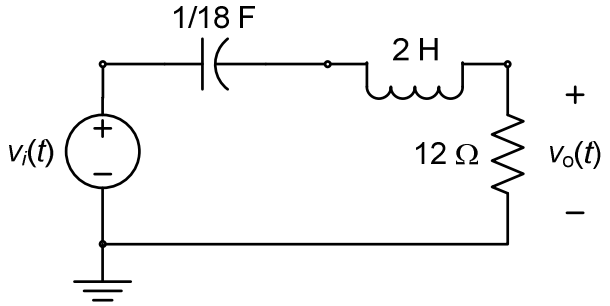
(6) (10 points) **Initial and final values.** Determine the initial and final values of $x(t)$ if the unilateral Laplace transform of $x(t)$ is given by

$$X(s)=\frac{5s^2+4s+6}{s^3+3s^2+2s}$$

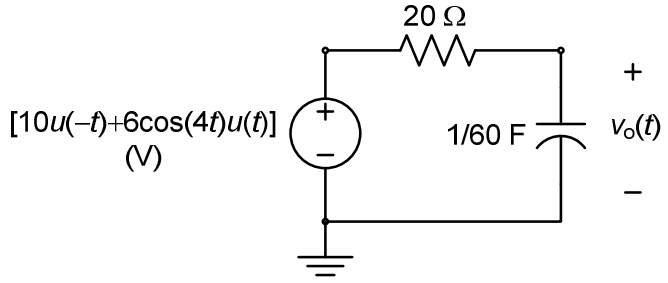
(7) (10 points) **Application of Laplace transform to electric circuits.** For the electric circuit shown, use Laplace transform to find the output voltage signal $v_o(t)$ for $t \geq 0$.



(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 output voltage signal $v_o(t)$ for $t \geq 0$.



(10) (10 points) **Applications of Laplace transform to solve differential equations.** Determine the response $y(t)$ for $t \geq 0$ of the differential equation with the specified input and initial conditions:

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = 2\frac{dx(t)}{dt},\ x(t) = 3e^{-t}u(t),\ y(0^-) = 4,\ \left.\frac{dy(t)}{dt}\right|_{t=0^-} = -1$$