NAME: **21 February 2019**

EE301 Signals and Systems **Exam 1**

Cover Sheet

Test Duration: 75 minutes.
Coverage: Chaps. 1,2
Open Book but Closed Notes.
One 8.5 in. x 11 in. crib sheet
Calculators NOT allowed.
DO NOT UNSTAPLE THE EXAM!
All work should be done in the space provided.
You must show ALL work or explain answer for each problem to receive full credit.

Prob. No.	Topic(s)	Points
1.	Continuous Time Signals and System Properties	50
2.	Discrete Time Signals and System Properties	50

VIP If you want to refer to the input signal and output signal for one part of a problem when solving a later part, use that part's letter as a subscript, e.g., you can refer to the input signal and corresponding output signal for part (d) of Prob. 1 as $x_d(t)$ and $y_d(t)$, respectively.

VIP: Solving and part, you can just write: z(t)= Formula A with a=-3 and b =-2 BUT don't have to write out Formula A substituting a=-3 and b=-2. Just use z(t) for remainder of your solution.

Formula A: $$e^{at}u(t) * e^{bt}u(t) = \frac{1}{a-b}e^{at}u(t) + \frac{1}{b-a}e^{bt}u(t)$$

Formula B: $$\alpha^n u[n] * \beta^n u[n] = \frac{\alpha}{\alpha-\beta}\alpha^n u[n] + \frac{\beta}{\beta-\alpha}\beta^n u[n]$$

Formula C: if $x(t) * h(t) = y(t)$ then: $a\, x(t-t_1) * b\, h(t-t_2) = ab\, y(t-(t_1+t_2))$

Formula D: if $x[n] * h[n] = y[n]$ then: $a\, x[n-n_1] * b\, h[n-n_2] = ab\, y[n-(n_1+n_2)]$

Formula E: $$e^{at}u(t) * e^{at}u(t) = te^{at}u(t)$$

Formula F: $$\alpha^n u[n] * \alpha^n u[n] = (n+1)\alpha^n u[n]$$

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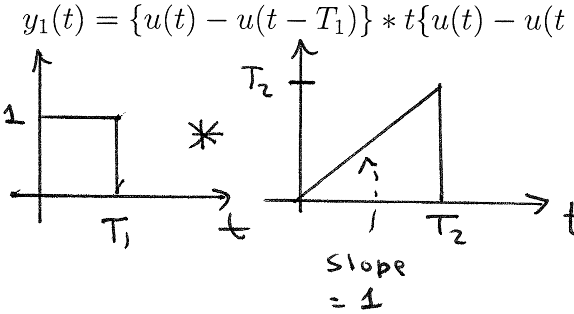
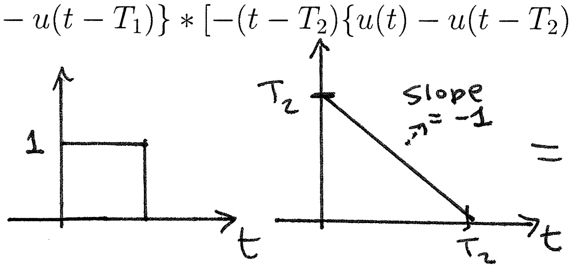
One 8.5 in. x 11 in. crib sheet
Calculators NOT allowed.
This test contains **two** problems.
All work should be done on the sheets provided.
You must show work or explain answer for each problem to receive full credit.
Plot your answers on the graphs provided.
WRITE YOUR NAME ON EVERY SHEET.

Prob. No.	**Topic(s)**	**Points**
1.	Continuous Time Signals and System Properties	50
2.	Discrete Time Signals and System Properties	50

$$
\begin{aligned}
y_1(t) = \{u(t)-u(t-T_1)\} * t\{u(t)-u(t-T_2)\} &= \frac{t^2}{2}\{u(t)-u(t-T_1)\} \\
&+ \left(T_1 t - \frac{T_1^2}{2}\right)\{u(t-T_1)-u(t-T_2)\} \\
&+ \left(-\frac{t^2}{2} + T_1 t + \frac{T_2^2 - T_1^2}{2}\right)\{u(t-T_2)-u(t-(T_1+T_2))\}
\end{aligned} \tag{1}
$$



$$
\begin{aligned}
\{u(t)-u(t-T_1)\} * [-(t-T_2)\{u(t)-u(t-T_2)\}] &= \left(-\frac{t^2}{2} + T_2 t\right)\{u(t)-u(t-T_1)\} \\
&+ \left(-T_1 t + \frac{2T_1T_2 + T_1^2}{2}\right)\{u(t-T_1)-u(t-T_2)\} \\
&+ \left(\frac{t^2}{2} - (T_1+T_2)t + \frac{(T_1+T_2)^2}{2}\right)\{u(t-T_2)-u(t-(T_1+T_2))\}
\end{aligned} \tag{2}
$$



$$
y_2(t) = \{u(t)-u(t-T_1)\} * [-(t-T_2)\{u(t)-u(t-T_2)\}] = y_1\left(-(t-(T_1+T_2)\right) \tag{3}
$$