Name: ____________________________

Instructions:
The examination lasts for 75 minutes and is closed book, closed notes. No electronic devices are permitted, including but not limited to calculators, cellphones, and other handheld devices. (Any such items in the examination room must be off and put away, subject to a 20 point penalty for the first violation and a score of 0 on the exam for the second violation.)

Do all your work on the pages in this exam booklet. Do not unstaple these pages. Any unstapled or restapled pages will NOT be graded. You may write on the backs of the pages if you need to, and attached at the back of the exam booklet are two extra work pages.

Show your work and clearly indicate your final answers. Neatness and organization in your work is important and will influence your grade.

Each problem is weighted toward the final total as shown below.

Grades

1. ________________ (20 pts.)
2. ________________ (20 pts.)
3. ________________ (20 pts.)
4. ________________ (20 pts.)
5. ________________ (20 pts.)
Total ________________ (100 pts.)
1. [20 points] For the signal $x(t)$ shown below, express $x(t)$ as a linear combination of shifted steps and ramps.

![Graph of $x(t)$ showing a step function and a ramp function.](image-url)
2. [20 points] Find $y[n] = x[n] \ast v[n]$ for all $n$ given that $v[n]$ and $x[n]$ are the signals shown below.
3. [20 points total, 5 points each] Let

\[ v(t) = \frac{1}{2} e^{-\frac{1}{2} t} u(t). \]

Find \( y(t) = v(t) \ast x(t) \) for the following signals \( x(t) \).

(a) \( x(t) = \delta(t) \).

(b) \( x(t) = \delta(t - 2) \).

(c) \( x(t) = u(t) \).

(d) \( x(t) = 3 u(t - 2) \).
4. [20 points] A linear, time-invariant system has an impulse response given by

\[ h(t) = 6 e^{-6t} u(t). \]

Find the system’s output \( y(t) \) if the input is

\[ x(t) = u(t - 3) - u(t - 6). \]
5. [20 points] Solve the linear difference equation

\[ y[n] - \frac{1}{3} y[n - 1] = x[n] - x[n - 1] \]

for \( n \geq 0 \) assuming \( y[-1] = 0 \) and \( x[n] = u[n] \).
EXTRA WORKSHEET (indicate problem number clearly)
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