ECE 218 SIGNALS AND SYSTEMS MIDTERM QUESTIONS

1) If the given $x(t)$ signal is as seen above:
   a) (8p) Evaluate the graph of $-2x_1\left(3-\frac{1}{2}t\right)+1$.
   b) (8p) Evaluate the graph of $2x_2[2-2n]$.
   c) (7p) Calculate the power and energy of $x_1(t)$.

2) a) (7p) $x[n] = e^{(-j2\pi n)} + e^{(j2\pi n)}$
   Determine whether the given signal is periodic or not? If it is not periodic why? If it is periodic then find the period of it?
   
   b) (8p)

Plot the Even part and Odd part of the signal for which the graph is given for.
3) Plot the signal graphs of the given functions below.

a) \( x_1[t] = r(t+1) - 2U(t-3) + \delta(t-4) - r(t-5) + \delta(t^2 - 4) \)

b) \( x_2[t] = 2r(t-1) - 2U(t+3) - r(2t-5) \)

4) \( 10p \) For \( x[n] = \left( \sum_{k=1}^{\infty} \delta[n-2-k] \right) - U[n-3] + 1 \) Express \( x[n] \) in terms of step functions.

5) Determine if the given signals are casual, memoryless, time invariant, linear or stable. Why?

a) \( 7p \) \( y[t] = 2x(t) + 3x^2(t-1) \)

b) \( 7p \) \( y[t] = \int_{-\infty}^{\infty} e^{(t-\sigma)} x^2(\sigma) d\sigma \)

6) \( 10p \) For the given characteristics equation \( \frac{d^3y}{dt^3} + 8 \frac{d^2y}{dt^2} + 17 \frac{dy}{dt} + \frac{dx}{dt} + 20x - 10 \) Find the homogenous solution.

7) \( 12p \) Evaluate the array of \( y[n] \) for the given system.

\[
x[n] = \begin{bmatrix} 1 & 0 & 2 & 3 & 4 & -1 & 0 & 2 \\
-3 & -2 & -1 & 0 & 1 & 2 & 3 & 4
\end{bmatrix}
\]

\[
h[n] = \begin{bmatrix} 1 & 0 & 0 & -1 & -2 & 1 \\
\end{bmatrix}
\]

Good Luck 😊