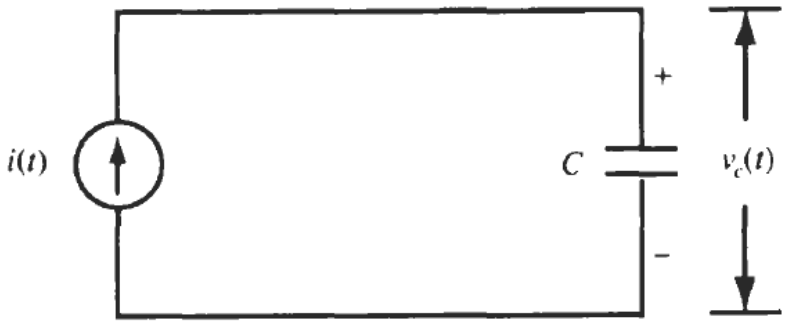
ASSIGNMENT

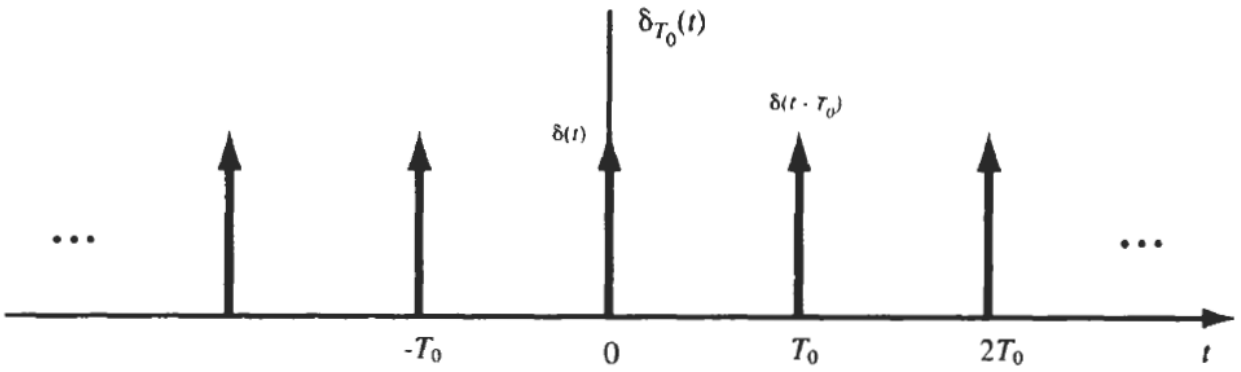
1. Determine whether the following signals are Energy, Power or neither.
   a. $e^{-at}u(t), \qquad a > 0$
   b. $x(t) = tu(t)$

2. Consider the capacitor shown in figure. Assume capacitance is constant. Let input x(t)=i(t) and output y(t)=v_c(t).
   a. Find the input-output relationship
   b. Determine whether the system is memoryless, causal, linear, time-invariant, stable.



3. Consider the periodic impulse train $\delta_{T_0}(t)$ shown in figure. It is defined as

$$\delta_{T_0}(t) = \sum_{k=-\infty}^{\infty} \delta(t - kT_0)$$



   a. Determine complex exponential Fourier series of the impulse train

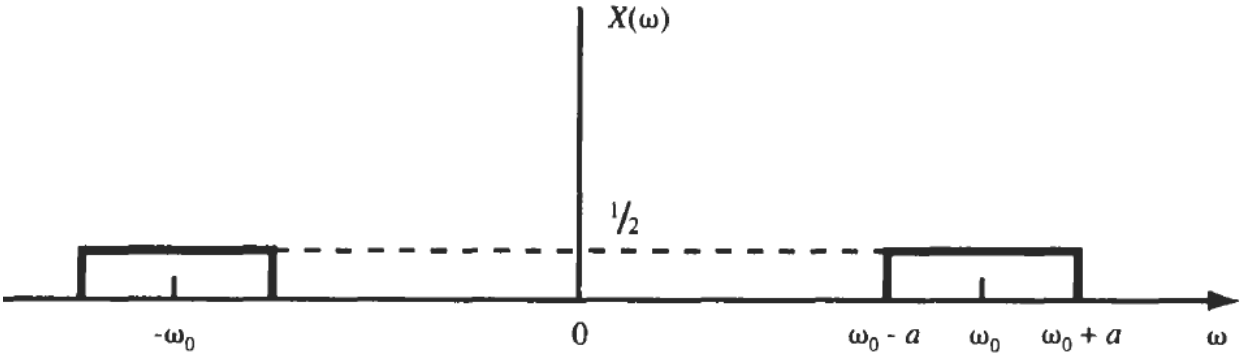
b. Determine trigonometric Fourier series of the impulse train

4. Prove modulation theorem of CTFT

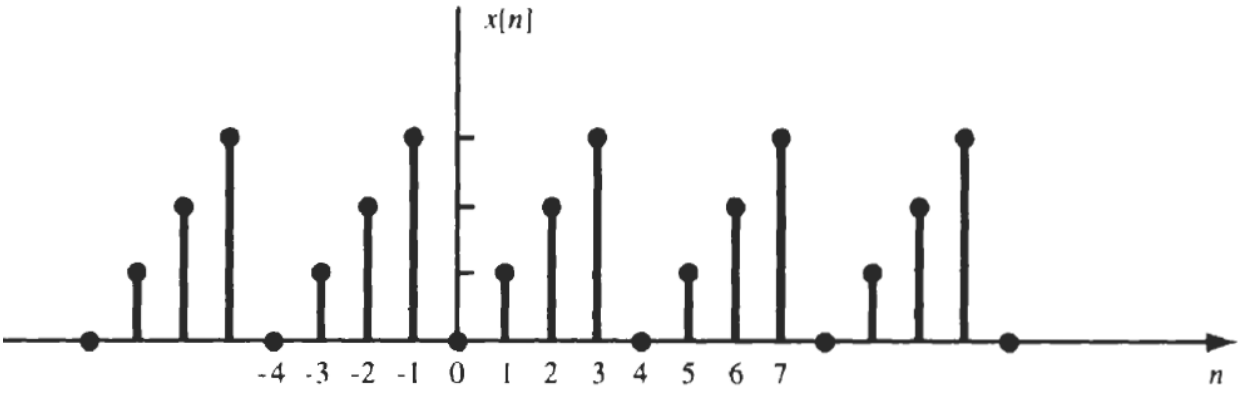
5. Fourier transform of x(t) is given in the figure. ($p_a(w)$ denotes a rectangular pulse centered at zero)

$$X(\omega) = \frac{1}{2}p_a(\omega - \omega_0) + \frac{1}{2}p_a(\omega + \omega_0)$$

Find and sketch x(t).



6. Find the Fourier coefficient for the periodic sequence shown in figure



7. Prove that

$$u[n] \leftrightarrow \pi\delta(\Omega) + \frac{1}{1-e^{-j\Omega}}, \qquad |\Omega| \leq \pi$$