Signals and Systems (CT 203)

Tutorial Sheet-02 DA-IICT, Gandhinagar.

1. For the following signals verify if they are of energy/power type. Accordingly compute the energy and power of the signal over a duration of T seconds

   (a) $g(t) = Ae^{j(2\pi f_0 t+\theta)}$

   (b) $g(t) = Ae^{-bt}(t > 0)$

   (c) $g(t) = t(t > 0)$

   (d) $g(t) = Kt^{-1/4}(t > 0)$

2. Let $x_1(t)$ and $x_2(t)$ are periodic signals with fundamental periods T_1 and T_2 respectively. Under what condition is the sum $x(t) = x_1(t) + x_2(t)$ is periodic, and what is the fundamental period of $x(t)$ if it is periodic? Is $x(t) = \cos(60\pi t) + \sin(50\pi t)$ periodic? If yes find fundamental time period.

3. Determine the values of E_∞ and P_∞ for each of the following signals

   (a) $x_1(t) = e^{-5t}u(t)$ (b) $x_2(t) = e^{j(4t+\pi/4)}$

   (c) $x_1(n) = \left(\frac{1}{3}\right)^n u(n)$

4. A continuous-time signal $x(t)$ is shown in Fig. 1. Sketch and label carefully each of the following signals:

   (a) $x(t-2)$ (b) $x(3-t)$

   (c) $x(2t+1)$ (d) $\left[x(t) + x(-t)\right] u(t)$

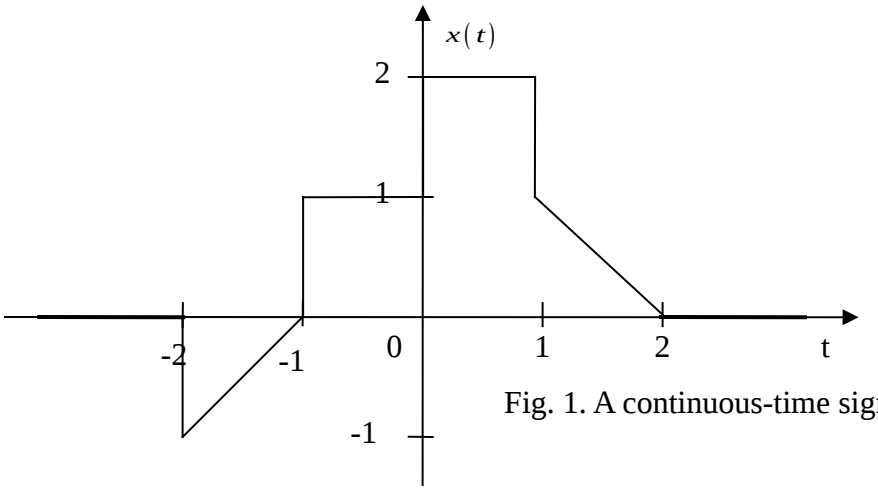

Fig. 1. A continuous-time signal

5. A discrete-time signal $x(n)$ is shown in Fig. 2. Sketch and label carefully each of the following signals:

   (a) $x(n-3)$ (b) $x(3-n)$

   (c) $x(3n)$ (d) $x(n-2)\delta(n-2)$

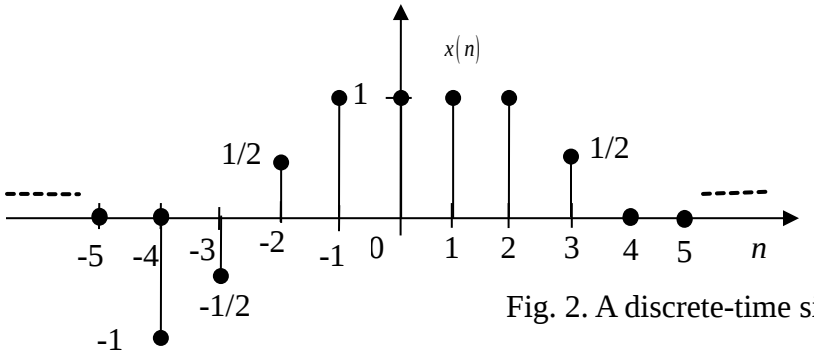

Fig. 2. A discrete-time signal

6. Determine whether each of the following signals is periodic

   (a) $x_1(n) = u(n) + u(-n)$ (b) $x_2(t) = 2e^{j(t+\pi/4)}u(t)$

   (c) $x_2(n) = u(n) + u(-n) - \delta(n)$ (d) $x_3(n) = \sum_{k=-\infty}^{+\infty} \{\delta(n-4k) - \delta(n-1-4k)\}$

7. Check whether the following results holds

   (a) $e^{j(\omega_o+2\pi)t} = e^{j\omega_o t}, \quad t \in$ ℑ (b) $e^{j(\omega_o+2\pi)n} = e^{j\omega_o n}, \quad n \in$ ℄

   Is there any conclusion from the solution of above problem in the context of *periodicity* of continuous time vs. discrete time complex exponential signal?

8. Prove that complex exponential signal, i.e., $x(t) = e^{j\omega_o t}$ has infinite total energy but finite average power.