In the Name of Allah

Assignment 3

Deadline : 1401 / 01 / 24

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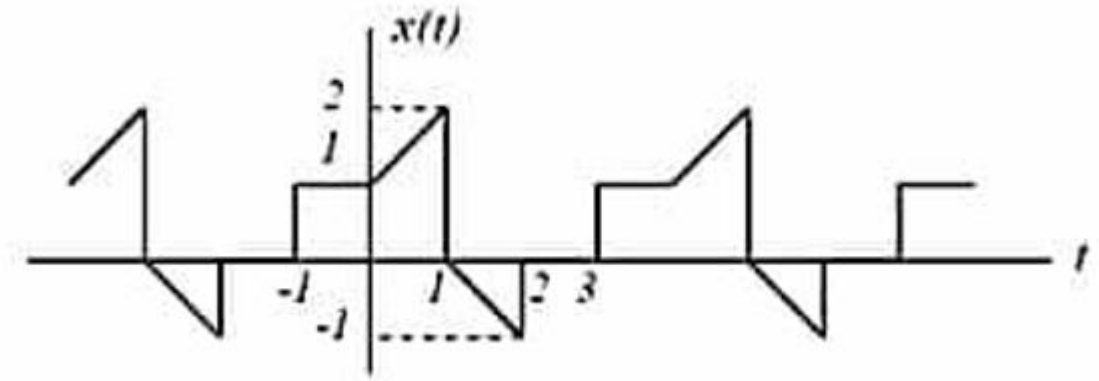
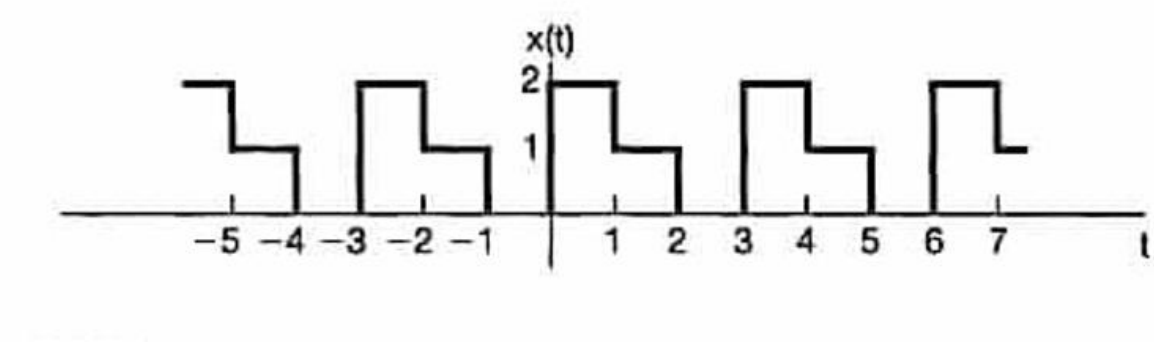
1. Calculate the fourier series coefficients for the following continuous-time signals.

(Hint : Use the fourier series properties)

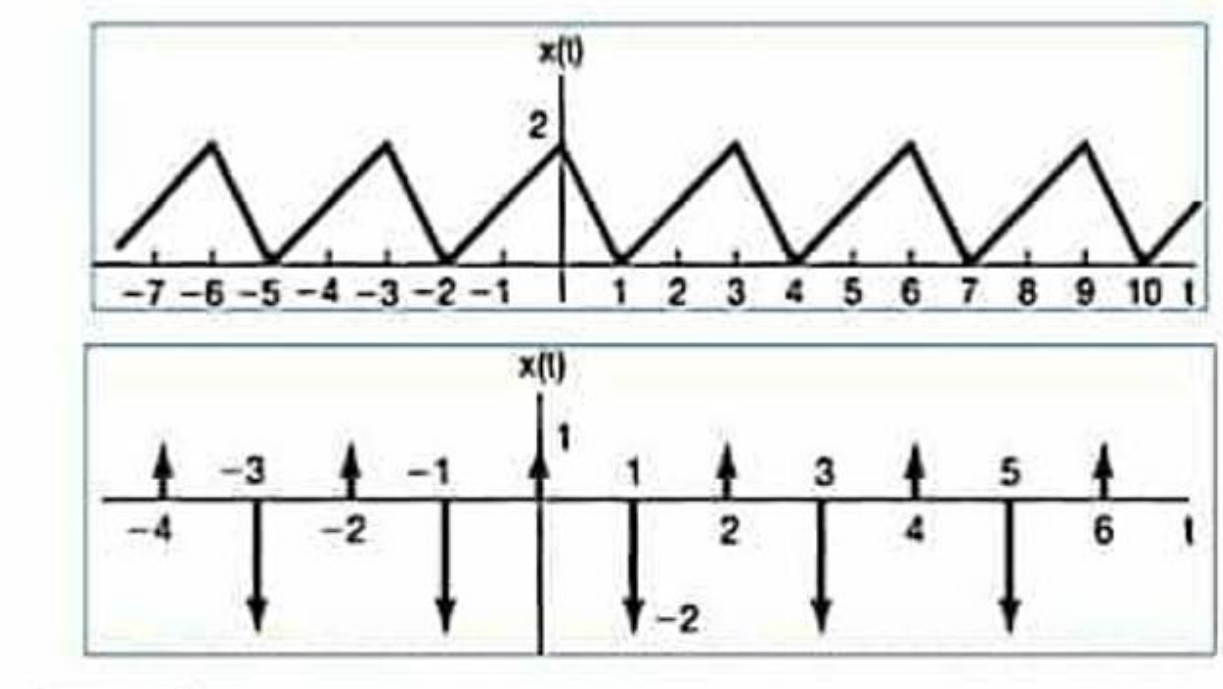
A)



B)



C , D)



2. The following information about the periodic signal are given :

a) $T = 3$

b) $a_k = a_{-k}$

c) $a_k = a_{k+2}$

d) $\int_{-\frac{1}{2}}^{\frac{1}{2}} x(t)dt = \frac{1}{2}\int_{\frac{1}{2}}^{\frac{3}{2}} x(t) = 1$

Find $x(t), a_k$

3. Let $x(t)$ be a periodic signal with fundamental period T and Fourier series coefficients a_k. Derive the Fourier series coefficients of each of the following signals in terms of a_k :

(a) $x(t-t_0)+x(t+t_0)$
(b) $\mathcal{E}v\{x(t)\}$
(c) Re $\{x(t)\}$
(d) $\frac{d^2x(t)}{dt^2}$
(e) $x(3t-1)$ [for this part, first determine the period of $x(3t-1)$]

4.

a) Calculate the fourier series of $x(t) = |\sin(t)|$

b) Caculate the following sum.

$$\sum_{k=-\infty}^{+\infty} \left(\frac{\sin\left(\frac{k6\pi}{7}\right)}{k\pi} \right)^2$$

5. A continuous-time periodic signal $x(t)$ with period T is said to be odd harmonic if, in its Fourier series representation

$$x(t) = \sum_{k=-\infty}^{+x} a_k e^{jk(2\pi/T)t},$$

$a_k = 0$ for every non-zero even integer k.

Show that if $x(t)$ is odd harmonic, then

$$x(t) = -x\left(t + \frac{T}{2}\right)$$

Good Luck