Sohag university
3th year power

Faculty of Engineering
Digital signal processing

SHEET NO (3)

5.4. Determine the complex exponential Fourier series representation for each of the following signals:

(a) $x(t) = \cos \omega_0 t$

(b) $x(t) = \sin \omega_0 t$

(c) $x(t) = \cos\left(2t + \frac{\pi}{4}\right)$

(d) $x(t) = \cos 4t + \sin 6t$

(e) $x(t) = \sin^2 t$

5.5. Consider the periodic square wave $x(t)$ shown in Fig. 5-8.

(a) Determine the complex exponential Fourier series of $x(t)$.

(b) Determine the trigonometric Fourier series of $x(t)$.

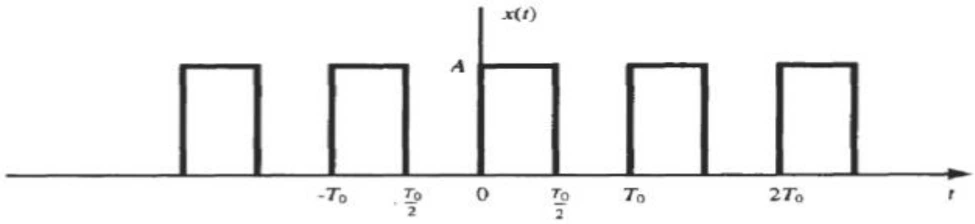


Fig. 5-8

5.7. Consider the periodic square wave $x(t)$ shown in Fig. 5-10.

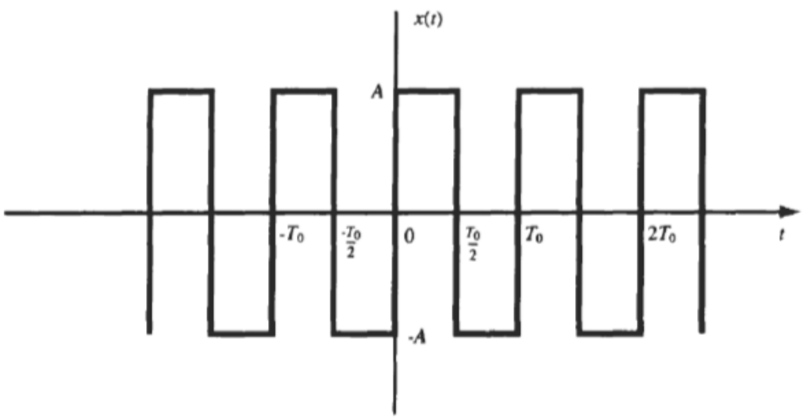
(a) Determine the complex exponential Fourier series of $x(t)$.

(b) Determine the trigonometric Fourier series of $x(t)$.

Note that $x(t)$ can be expressed as

$$x(t) = x_1(t) - A$$

where $x_1(t)$ is shown in Fig. 5-11. Now comparing Fig. 5-11 and Fig. 5-8 in Prob. 5.5, we see that $x_1(t)$ is the same square wave of $x(t)$ in Fig. 5-8 except that A becomes $2A$.



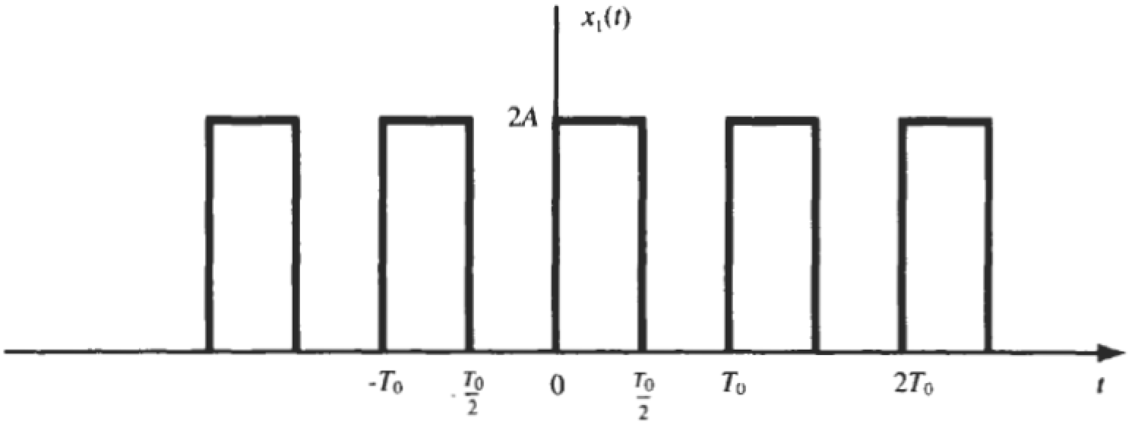


Fig. 5-11

5.9. Consider the triangular wave $x(t)$ shown in Fig. 5-13(a). Using the differentiation technique, find (a) the complex exponential Fourier series of $x(t)$, and (b) the trigonometric Fourier series of $x(t)$.

The derivative $x'(t)$ of the triangular wave $x(t)$ is a square wave as shown in Fig. 5-13(b).