Sohag university
3th year

Faculty of Engineering
Signal and systems

SHEET NO (2)

2.1. Verify Eqs. (2.7) and (2.8), that is,

(a) $x(t) * h(t) = h(t) * x(t)$

(b) $\{x(t) * h_1(t)\} * h_2(t) = x(t) * \{h_1(t) * h_2(t)\}$

2.2. Show that

(a) $x(t) * \delta(t) = x(t)$

(b) $x(t) * \delta(t - t_0) = x(t - t_0)$

(c) $x(t) * u(t) = \int_{-\infty}^{t} x(\tau)\, d\tau$

(d) $x(t) * u(t - t_0) = \int_{-\infty}^{t-t_0} x(\tau)\, d\tau$

2.7. Let $h(t)$ be the triangular pulse shown in Fig. 2-10(a) and let $x(t)$ be the unit impulse train [Fig. 2-10(b)] expressed as

$$x(t) = \delta_T(t) = \sum_{n=-\infty}^{\infty} \delta(t - nT) \qquad (2.68)$$

Determine and sketch $y(t) = h(t) * x(t)$ for the following values of T: (a) $T = 3$, (b) $T = 2$, (c) $T = 1.5$.

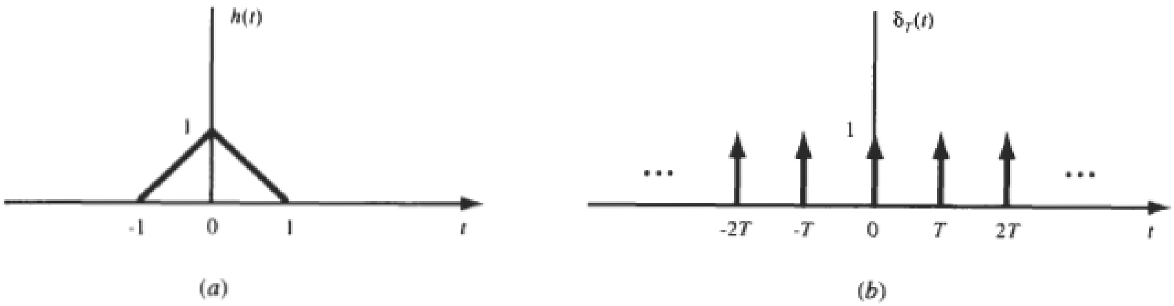

Fig. 2-10

2.14. The system shown in Fig. 2-17(a) is formed by connecting two systems *in cascade*. The impulse responses of the systems are given by $h_1(t)$ and $h_2(t)$, respectively, and

$$h_1(t) = e^{-2t}u(t) \qquad h_2(t) = 2e^{-t}u(t)$$

(a) Find the impulse response $h(t)$ of the overall system shown in Fig. 2-17(b).

(b) Determine if the overall system is BIBO stable.

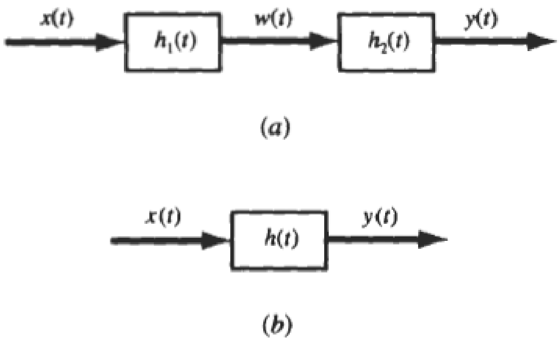

Fig. 2-17

2.30. Evaluate $y[n] = x[n] * h[n]$, where $x[n]$ and $h[n]$ are shown in Fig. 2-23, (a) by an analytical technique, and (b) by a graphical method.

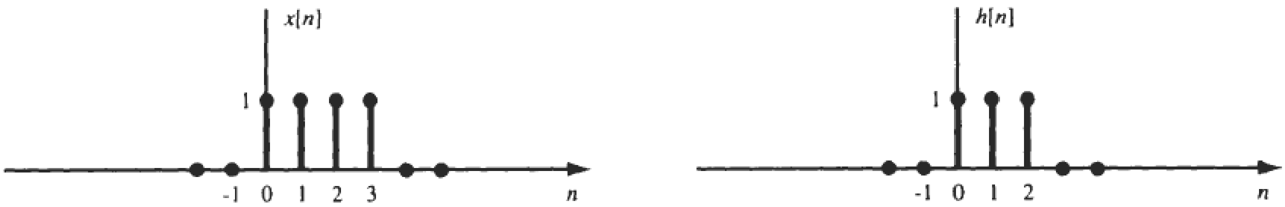

Fig. 2-23

2.28. The input $x[n]$ and the impulse response $h[n]$ of a discrete-time LTI system are given by

$$x[n] = u[n] \qquad h[n] = \alpha^n u[n] \qquad 0 < \alpha < 1$$

Compute the output y[n]