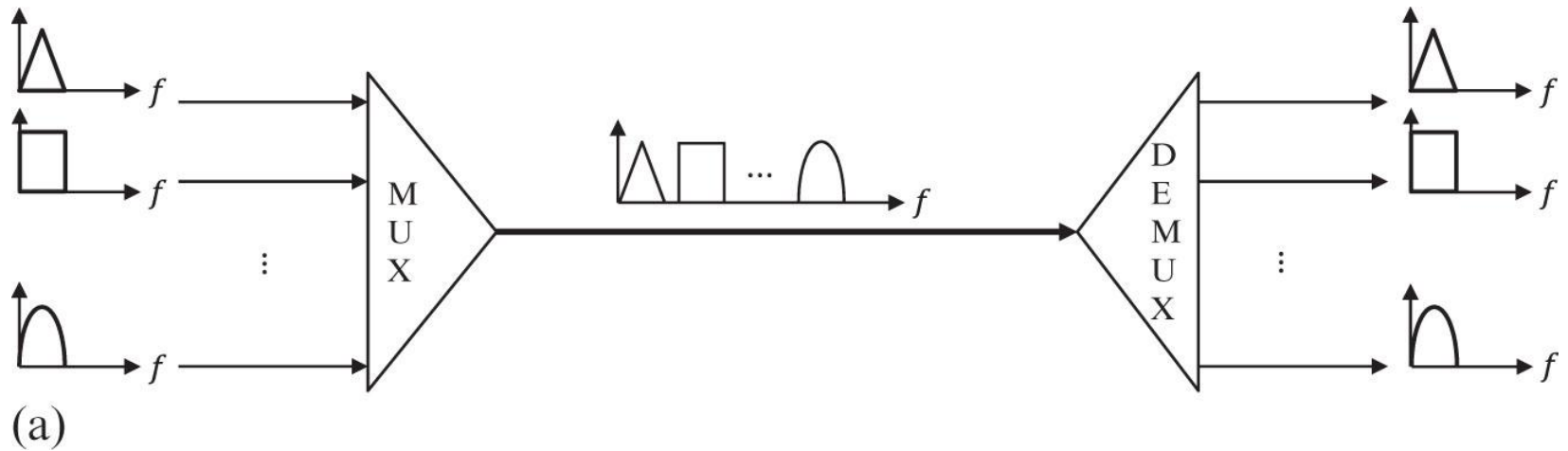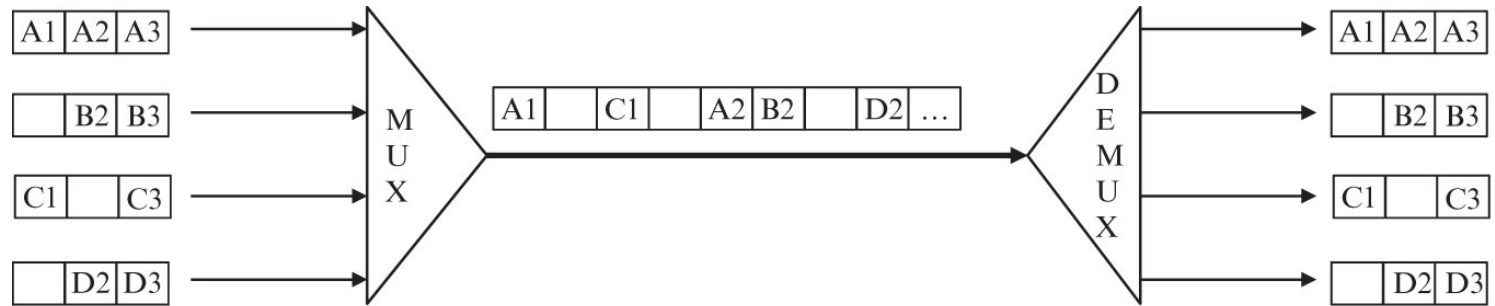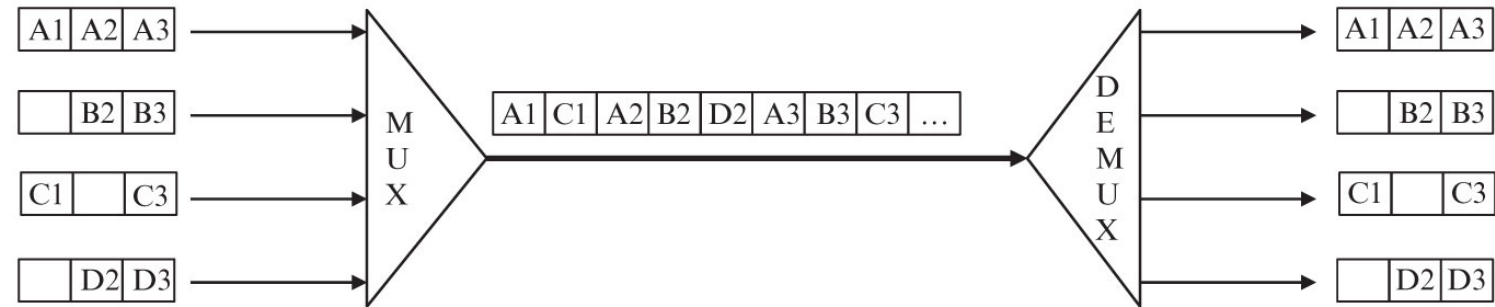# Chapter 11

Communication Networks

Figure 11.1a Multiplexing: (a) frequency-division multiplexing, (b) synchronous time-division multiplexing, (c) asynchronous time-division multiplexing, and d) wavelength-division multiplexing.

Figure 11.1bc Multiplexing: (a) frequency-division multiplexing, (b) synchronous time-division multiplexing, (c) asynchronous time-division multiplexing, and d) wavelength-division multiplexing.
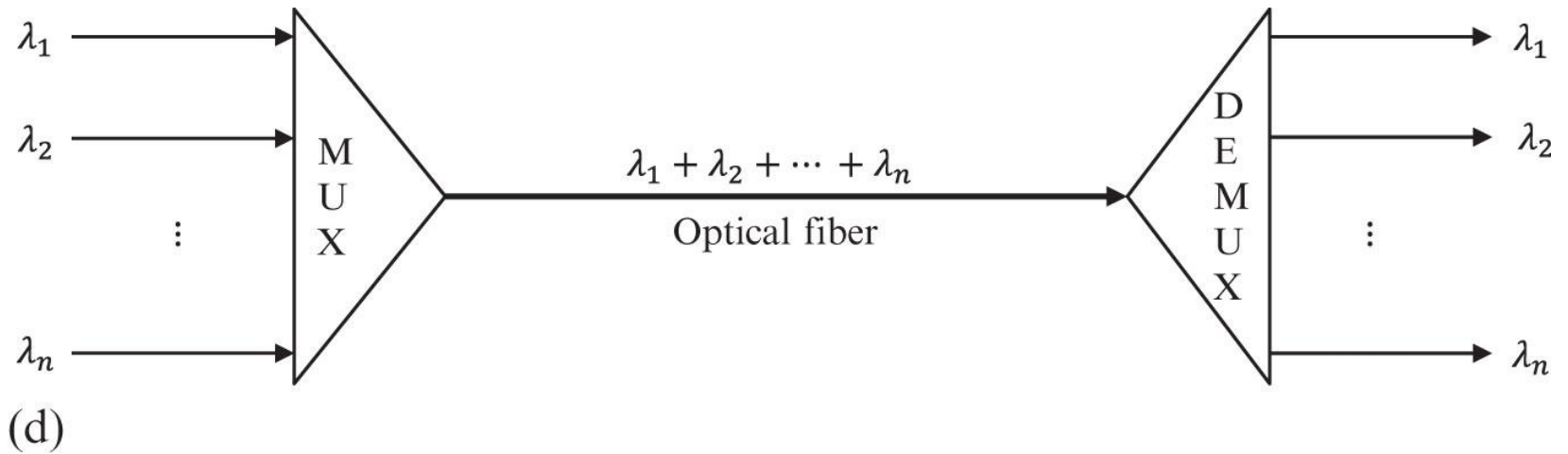
Figure 11.1d Multiplexing: (a) frequency-division multiplexing, (b) synchronous time-division multiplexing, (c) asynchronous time-division multiplexing, and d) wavelength-division multiplexing.
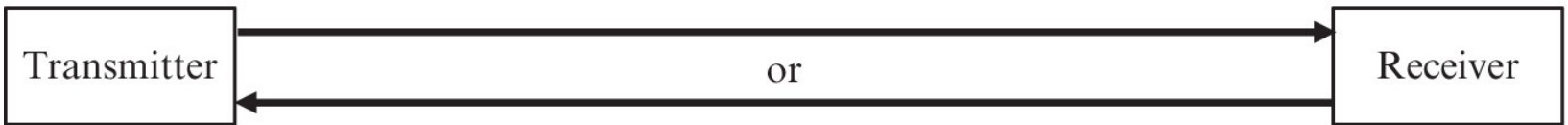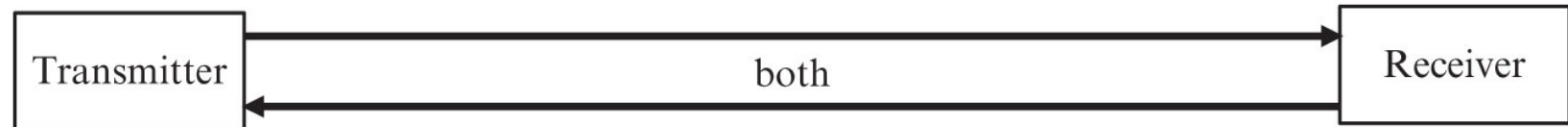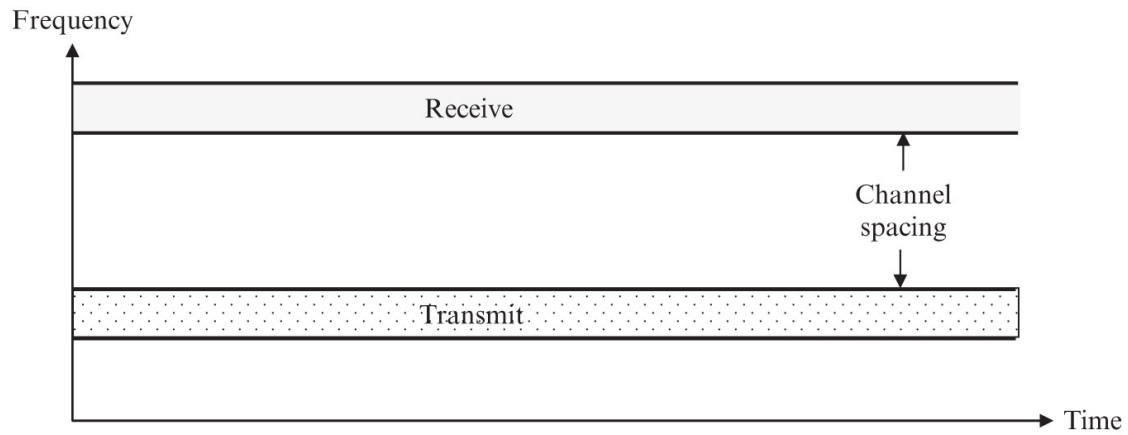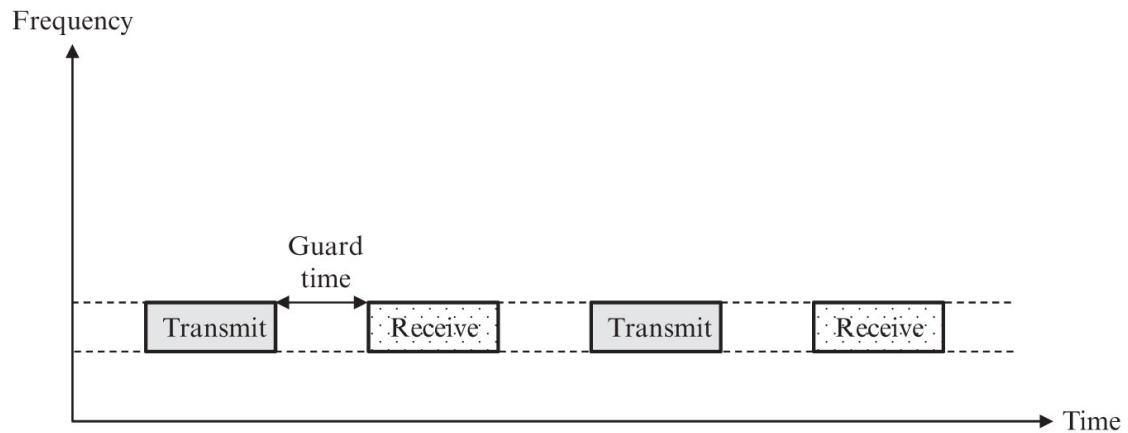
Figure 11.2 Communication modes: (a) simplex communication, (b) half-duplex communication, and (c) full-duplex communication.

Figure 11.3 Duplexing: (a) frequency-division duplexing and (b) time-division duplexing.
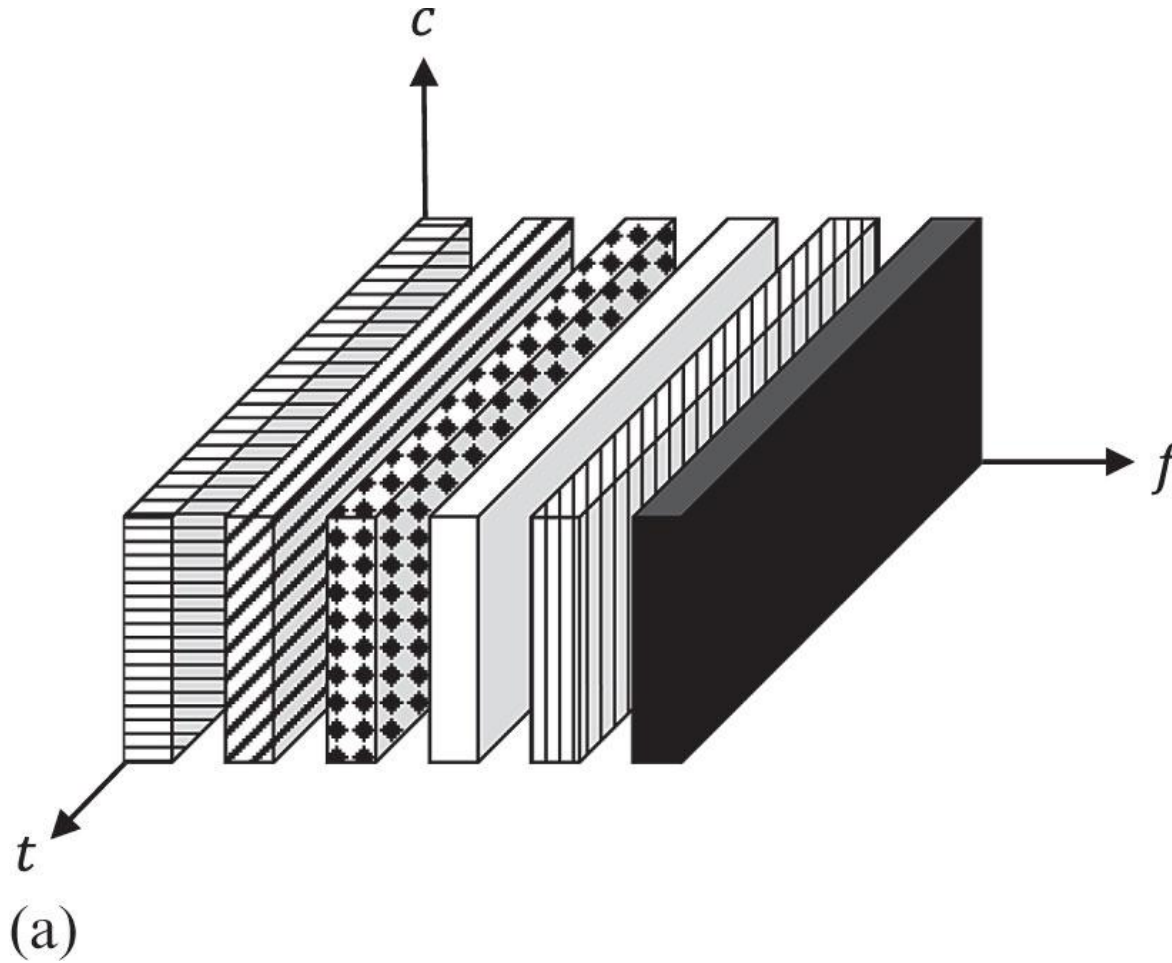
Figure 11.4a Multiple access: (a) frequency-division multiple access, (b) time-division multiple access, and (c) code-division multiple access.
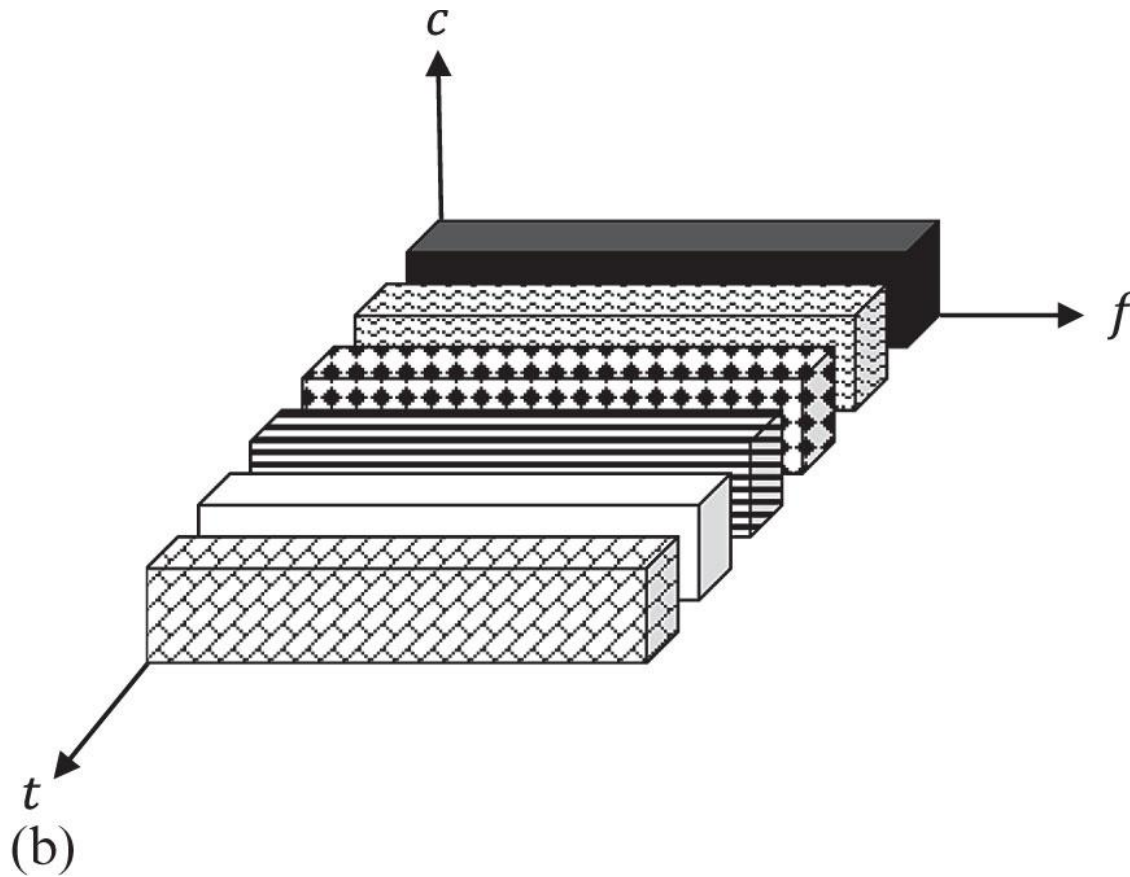
Figure 11.4b Multiple access: (a) frequency-division multiple access, (b) time-division multiple access, and (c) code-division multiple access.
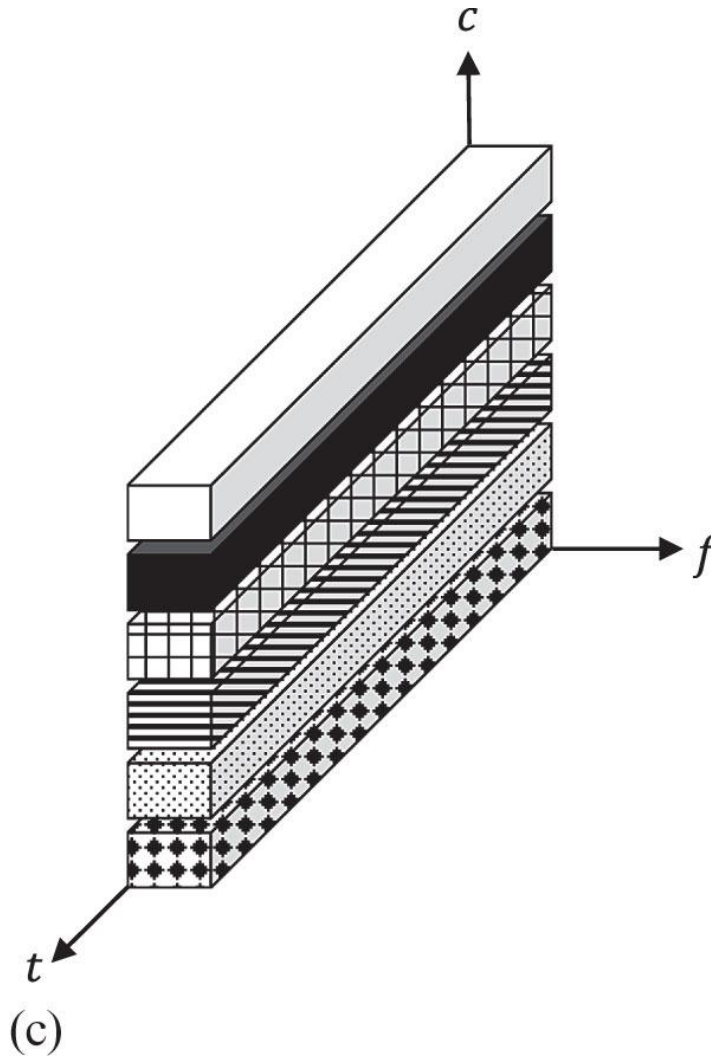
Figure 11.4c Multiple access: (a) frequency-division multiple access, (b) time-division multiple access, and (c) code-division multiple access.
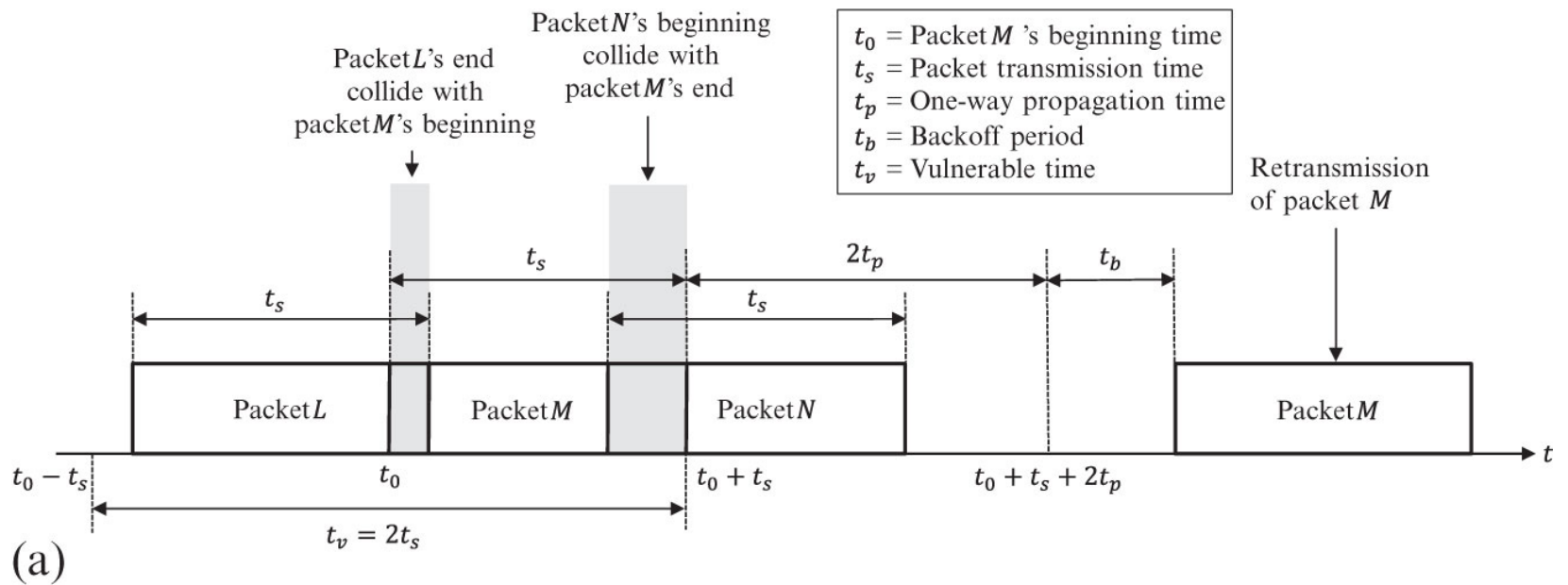
9

Figure 11.5a Vulnerable time: (a) unslotted ALOHA and (b) slotted ALOHA.
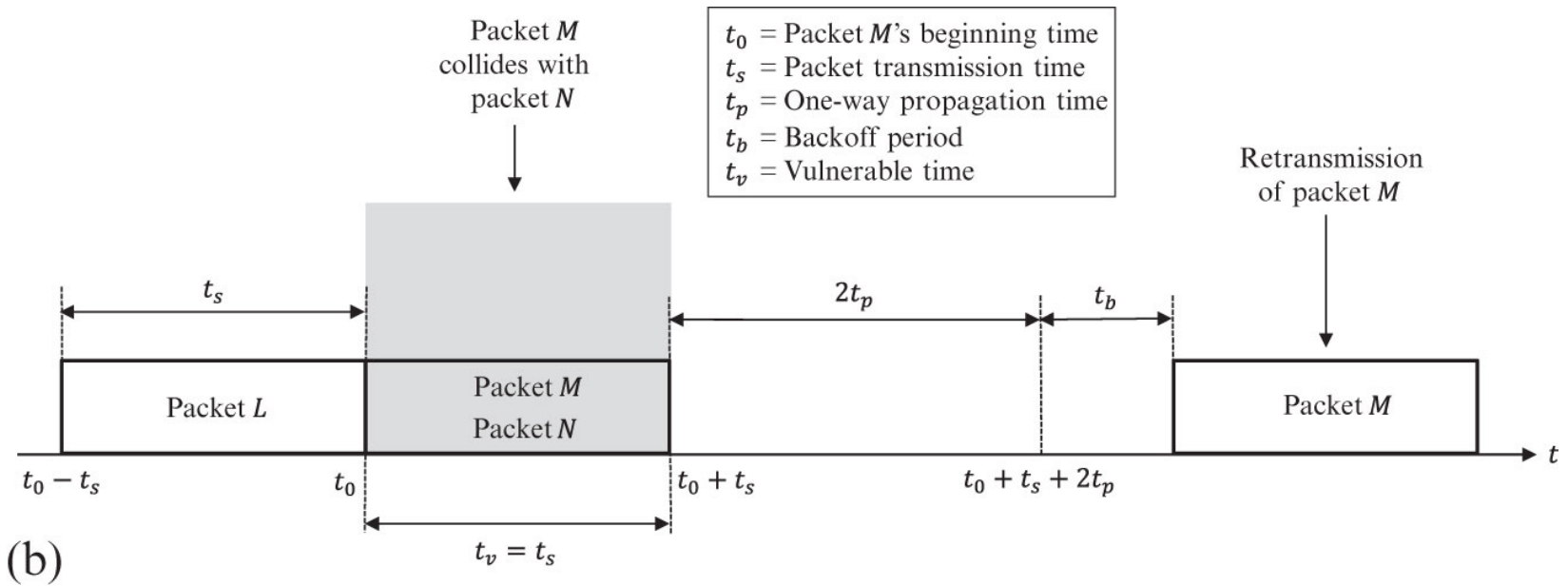
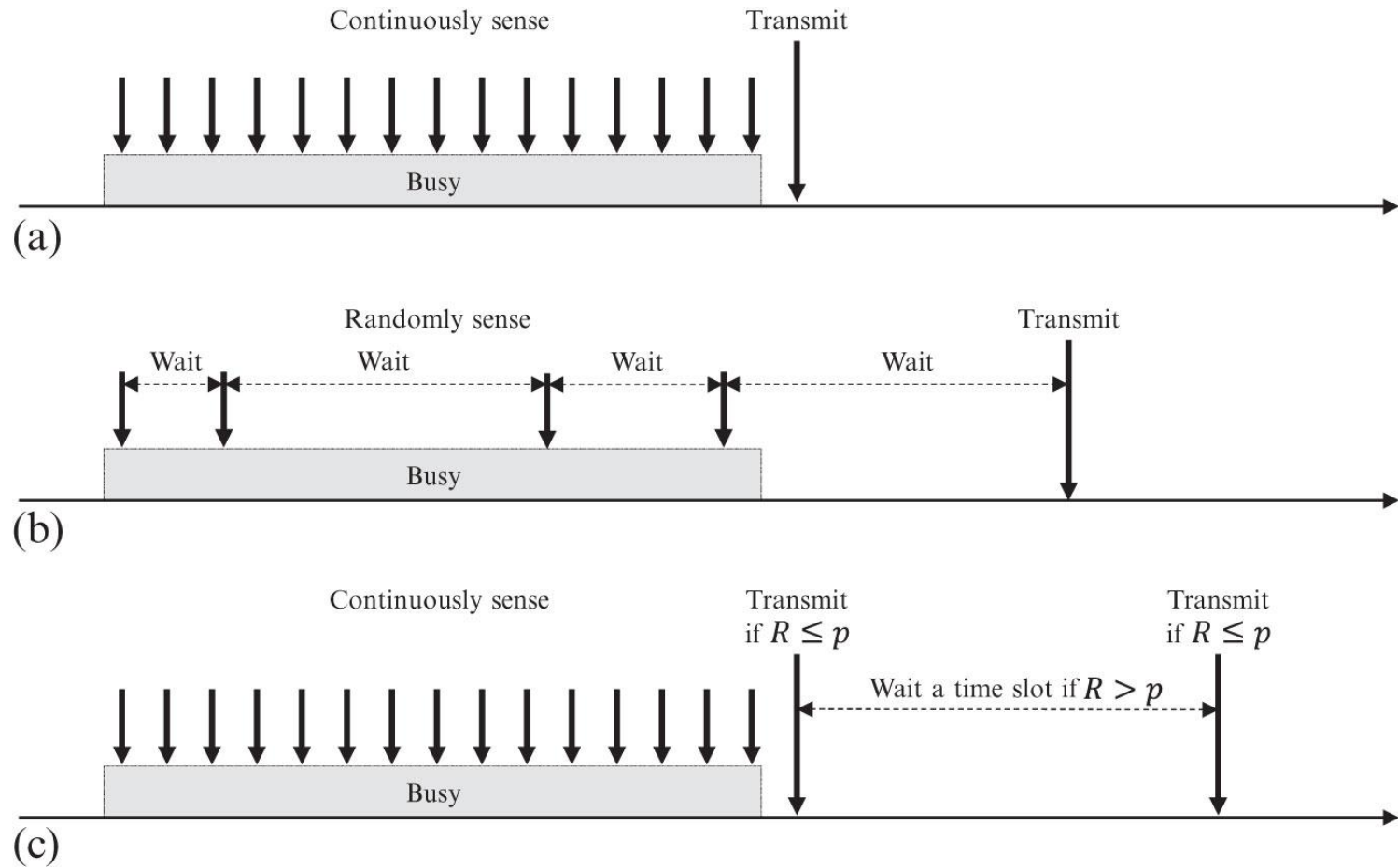**Figure 11.5b** Vulnerable time: (a) unslotted ALOHA and (b) slotted ALOHA.

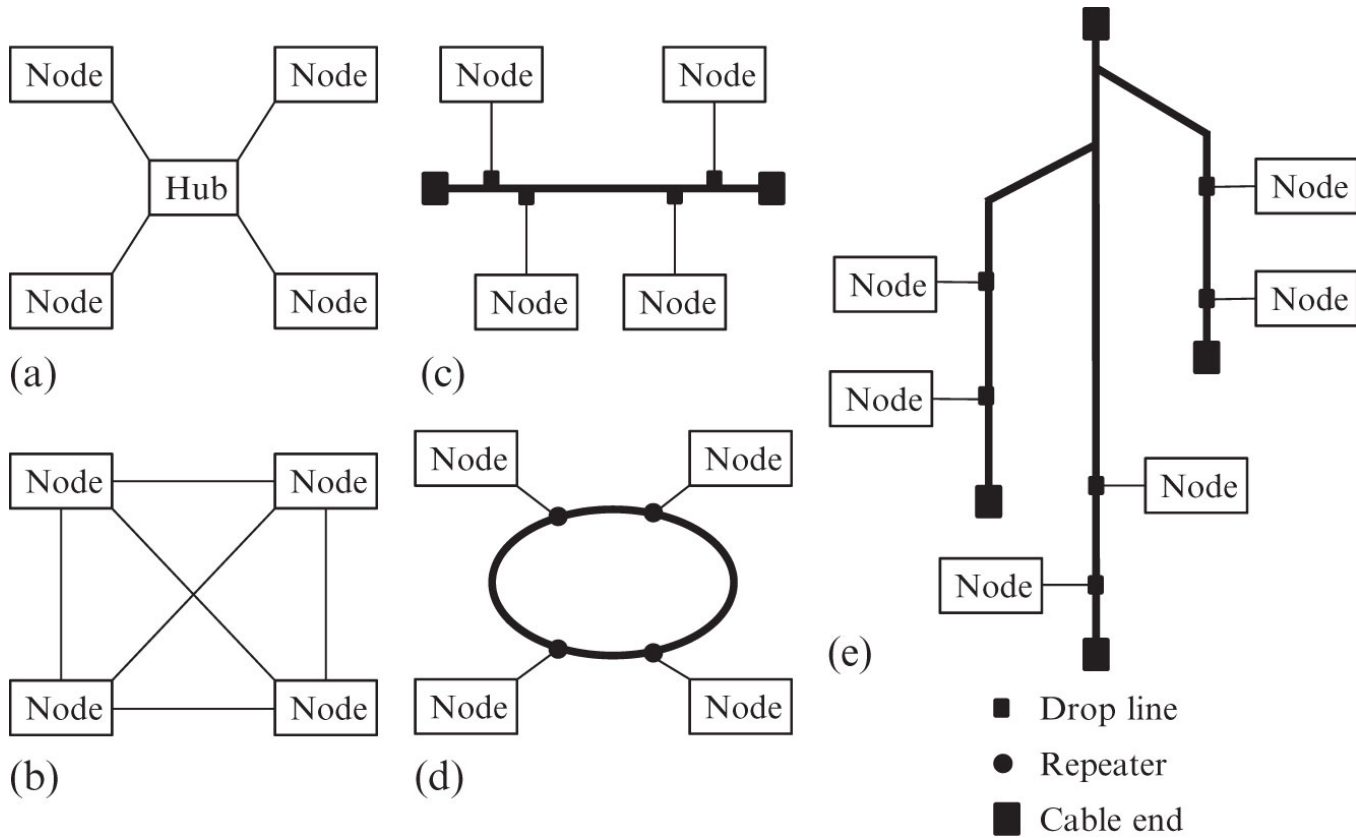**Figure 11.6** Behavior of persistence methods: (a) 1-persistent, (b) nonpersistent, and (c) p-persistent.

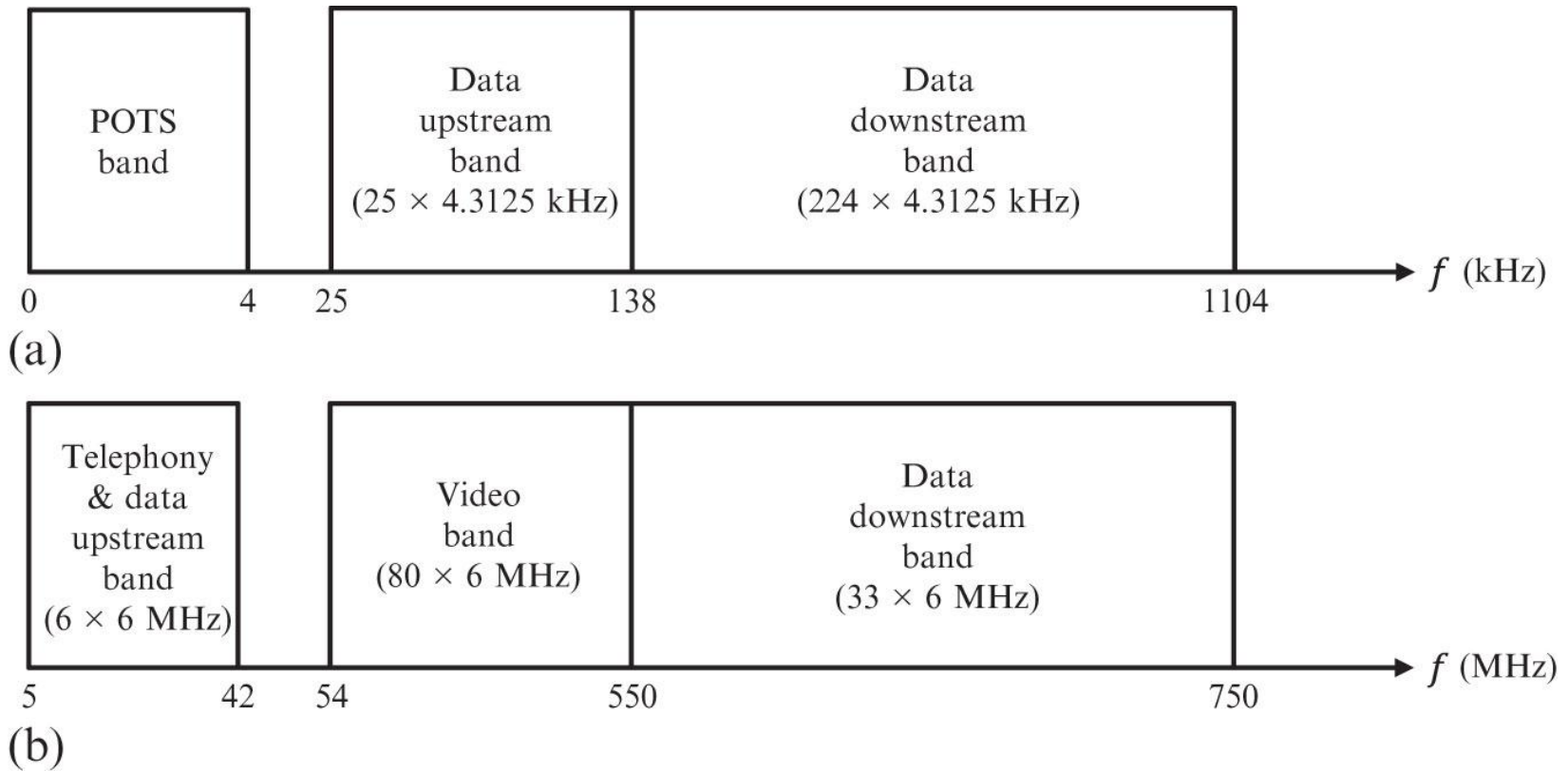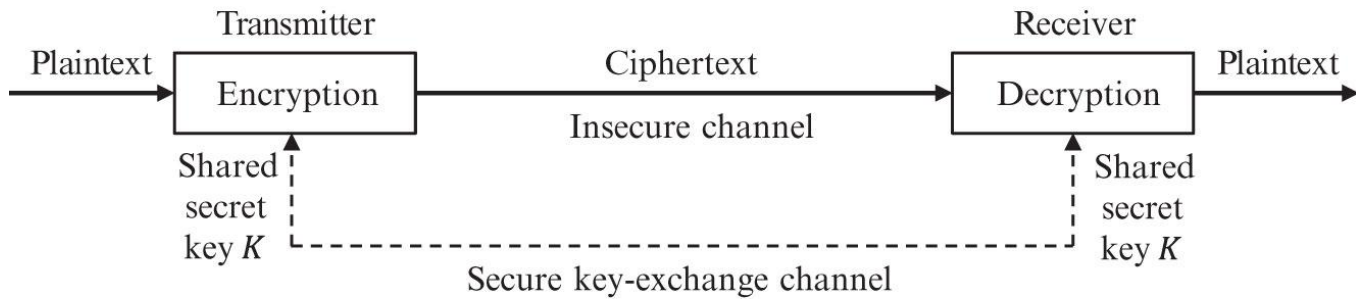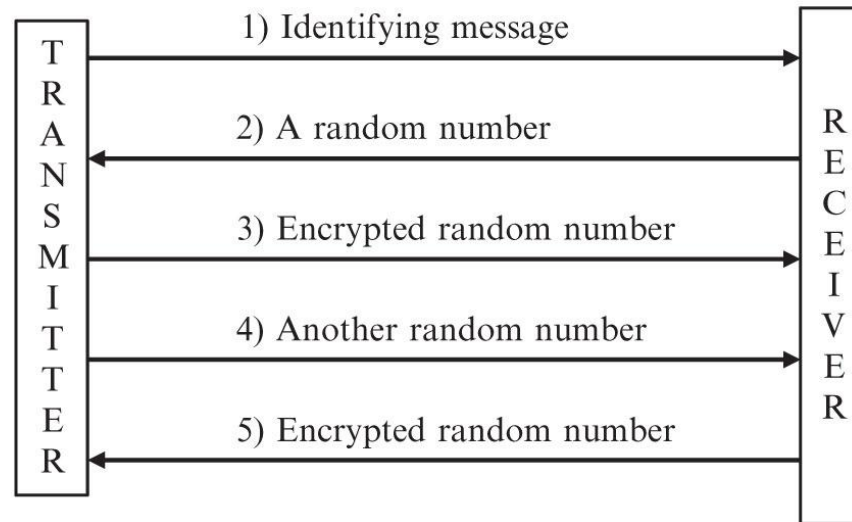**Figure 11.7** Topology: (a) star, (b) mesh, (c) bus, (d) ring, and (e) tree.

Figure 11.8 Spectrum allocation: (a) ADSL and (b) CATV.

Figure 11.9 Private-key: (a) cryptography and (b) authentication.

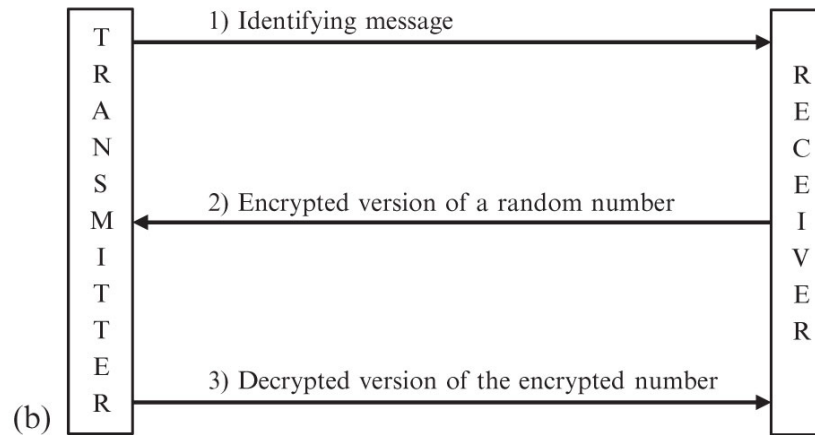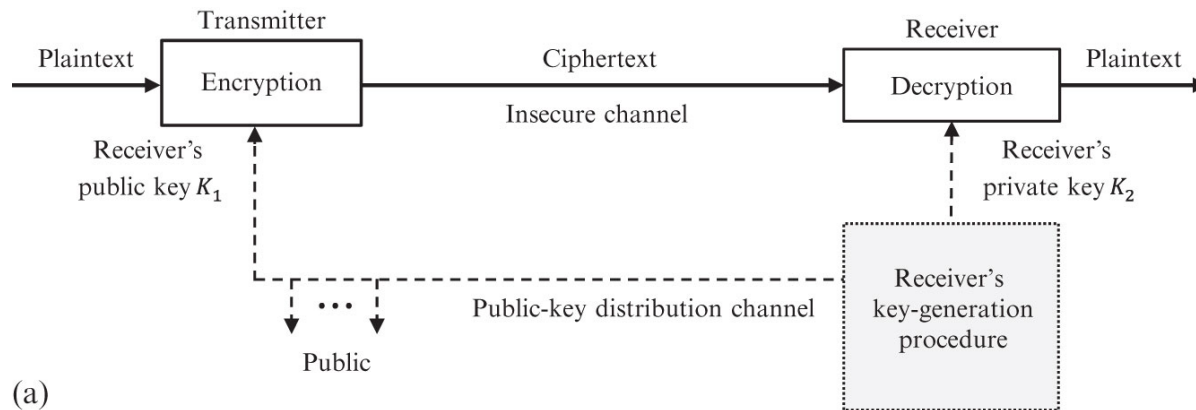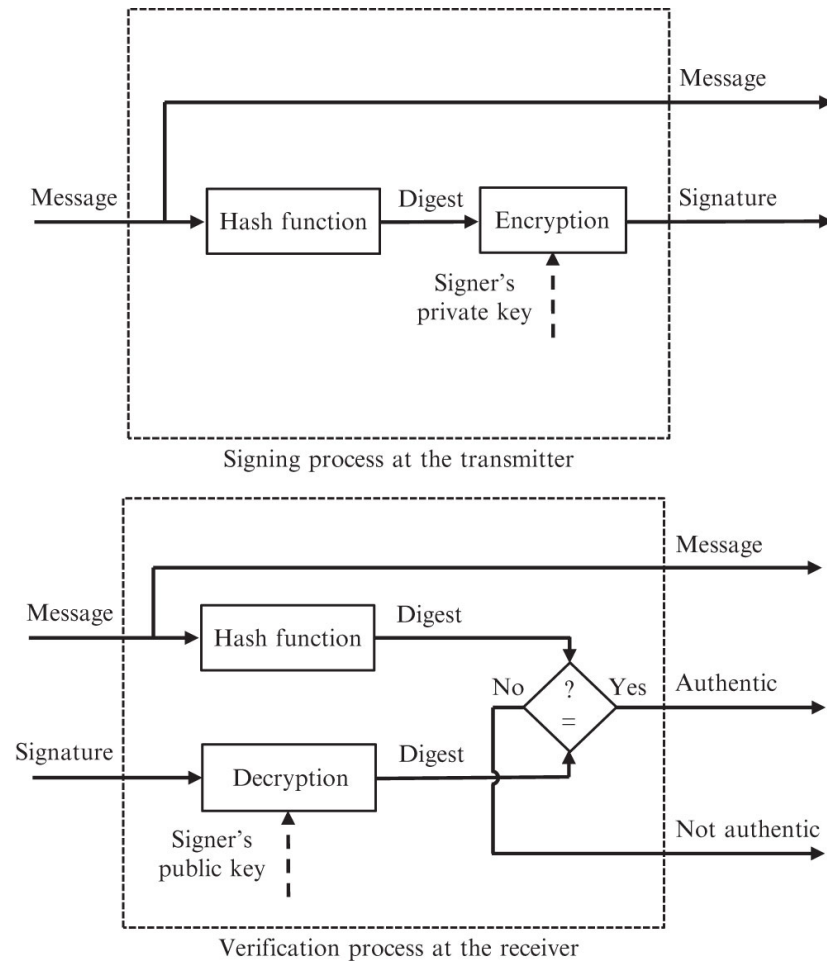**Figure 11.10** Public-key: (a) cryptography and (b) authentication.

Figure 11.11 Digital-signature signing and verification processes.