TABLE 4.3 Frequency Ranges of Electromagnetic Signals

Type of Signal	Wavelength (m)	Frequency Range (Hz)
Radio broadcast	10^4–10^2	3×10^4–3×10^6
Shortwave radio signals	10^2–10^{-2}	3×10^6–3×10^{10}
Radar, satellite communications, space communications, common-carrier microwave	1–10^{-2}	3×10^8–3×10^{10}
Infrared	10^{-3}–10^{-6}	3×10^{11}–3×10^{14}
Visible light	3.9×10^{-7}–8.1×10^{-7}	3.7×10^{14}–7.7×10^{14}
Ultraviolet	10^{-7}–10^{-8}	3×10^{15}–3×10^{16}
Gamma rays and X rays	10^{-9}–10^{-10}	3×10^{17}–3×10^{18}

TABLE 4.1 Frequency Ranges of Some Biological Signals

Type of Signal	Frequency Range (Hz)
Electroretinogram[a]	0–20
Electronystagmogram[b]	0–20
Pneumogram[c]	0–40
Electrocardiogram (ECG)	0–100
Electroencephalogram (EEG)	0–100
Electromyogram[d]	10–200
Sphygmomanogram[e]	0–200
Speech	100–4000

[a] A graphic recording of retina characteristics.
[b] A graphic recording of involuntary movement of the eyes.
[c] A graphic recording of respiratory activity.
[d] A graphic recording of muscular action, such as muscular contraction.
[e] A recording of blood pressure.

TABLE 4.2 Frequency Ranges of Some Seismic Signals

Type of Signal	Frequency Range (Hz)
Wind noise	100–1000
Seismic exploration signals	10–100
Earthquake and nuclear explosion signals	0.01–10
Seismic noise	0.1–1

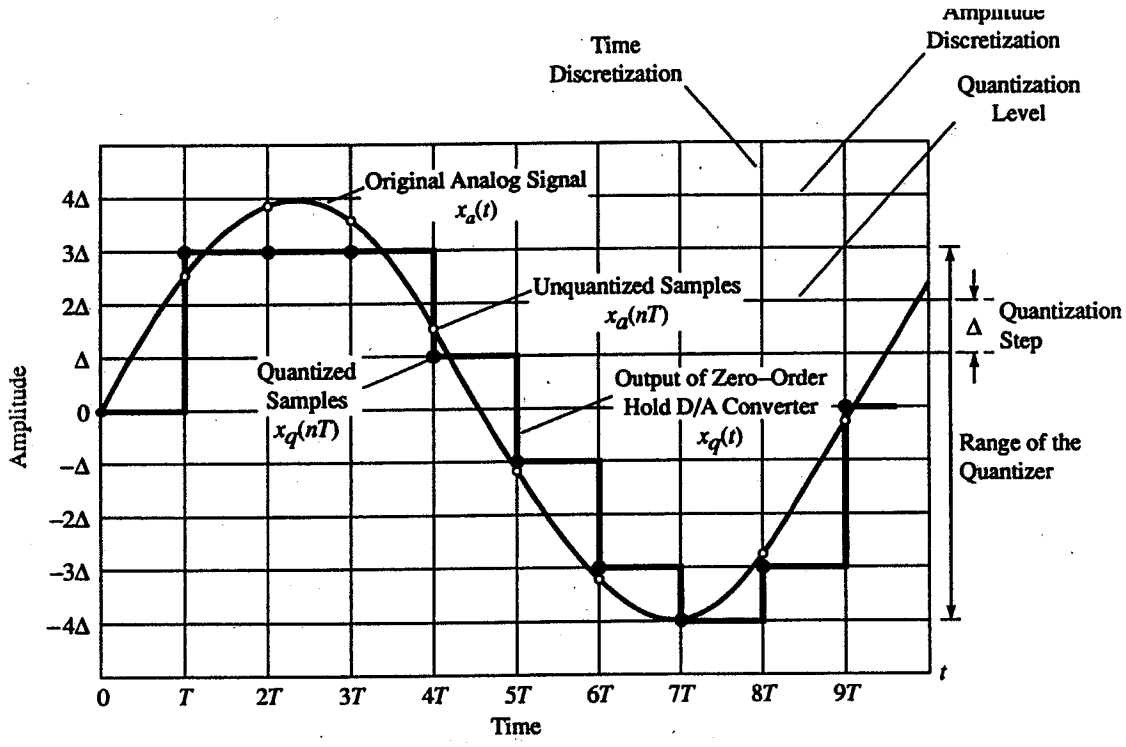

Figure 1.4.8 Sampling and quantization of a sinusoidal signal.

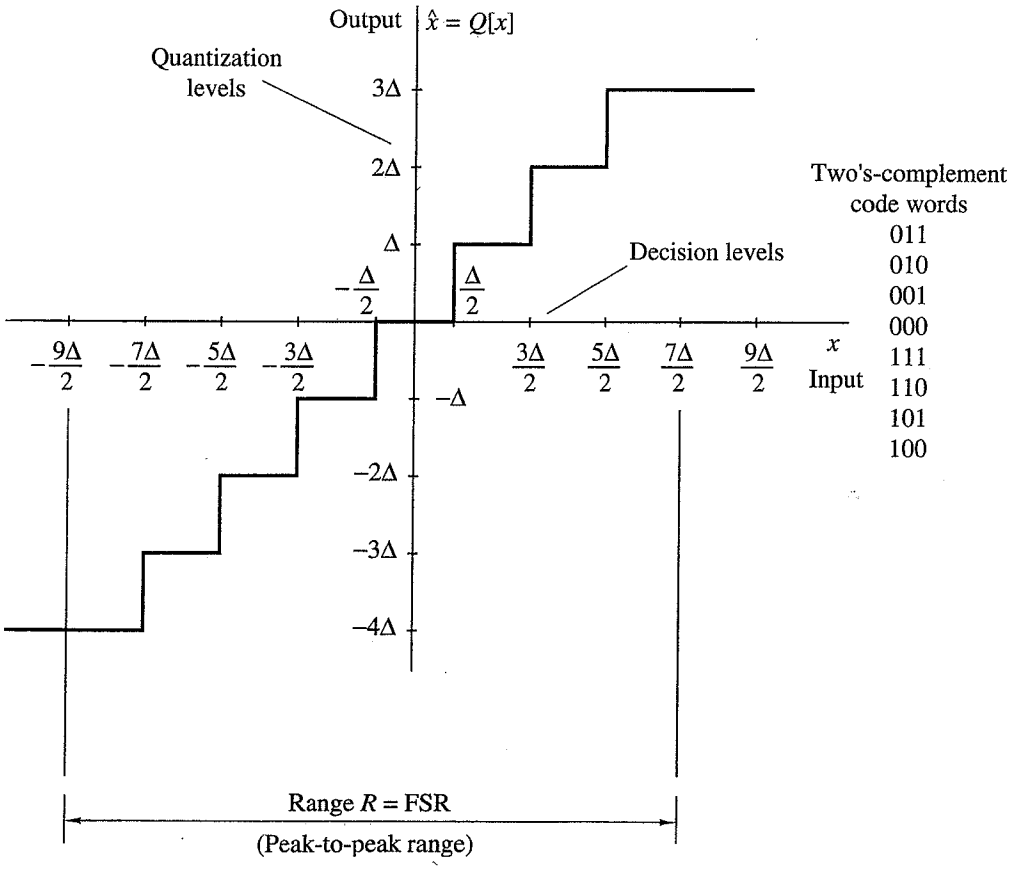

Figure 6.3.3 Example of a midtread quantizer.