2.2 Express the sequence $x[n] = 1, \ -\infty < n < \infty$, in terms of the unit step sequence $\mu[n]$.

2.5 Consider the following sequences:

$$x[n] = \{-4 \quad 5 \quad 1 \quad -2 \quad -3 \quad 0 \quad 2\}, \ -3 \le n \le 3$$

$$y[n] = \{6 \quad -3 \quad -1 \quad 0 \quad 8 \quad 7 \quad -2\}, \ -1 \le n \le 5$$

$$w[n] = \{3 \quad 2 \quad 2 \quad -1 \quad 0 \quad -2 \quad 5\}, \ 2 \le n \le 8.$$

The sample values of each of the above sequences outside the ranges specified are all zeros. Generate the following sequences: (a) $c[n] = x[-n+2]$, (b) $d[n] = y[-n-3]$, (c) $e[n] = w[-n]$, (d) $u[n] = x[n] + y[n-2]$, (e) $v[n] = x[n] \cdot w[n+4]$, (f) $s[n] = y[n] - w[n+4]$, and (g) $r[n] = 3.5y[n]$.

2.7 Analyze the block diagrams of Figure P2.1 and develop the relation between $y[n]$ and $x[n]$.

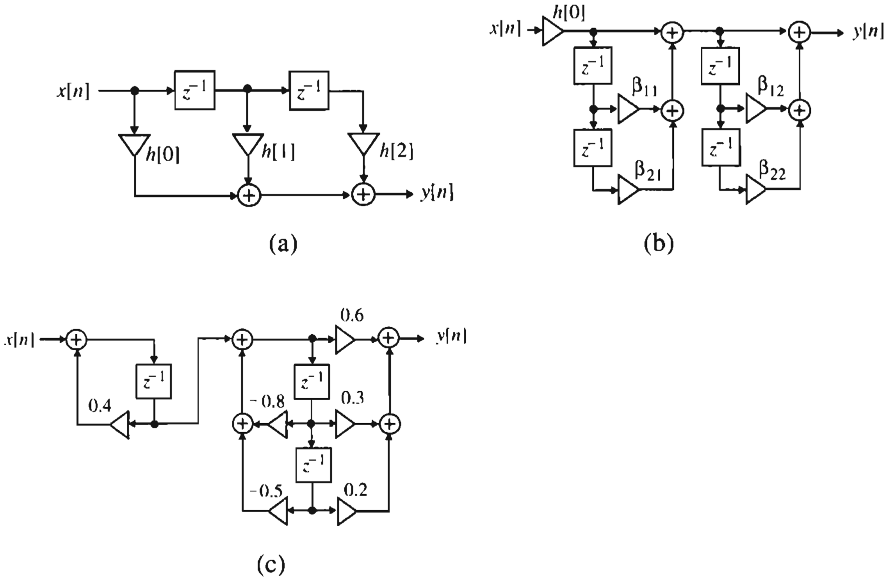

Figure P2.1

2.12 Let $x_{ev}[n]$ and $x_{od}[n]$ be even and odd real sequences, respectively. Which one of the following sequences is an even sequence, and which one is an odd sequence?
(a) $g[n] = x_{ev}[n]x_{ev}[n]$, (b) $u[n] = x_{ev}[n]x_{od}[n]$, (c) $v[n] = x_{od}[n]x_{od}[n]$.

2.13 (a) Show that a causal real sequence $x[n]$ can be fully recovered from its even part $x_{ev}[n]$ for all $n \ge 0$, whereas it can be recovered from its odd part $x_{od}[n]$ only for all $n > 0$.

(b) Is it possible to fully recover a causal complex sequence $y[n]$ from its conjugate antisymmetric part $y_{ca}[n]$? Can $y[n]$ be fully recovered from its conjugate symmetric part $y_{cs}[n]$? Justify your answers.

2.31 Determine the fundamental period of the sinusoidal sequence $x[n] = A\sin(\omega_o n)$ for the following values of the angular frequency ω_o:

(a) 0.6π, (b) 0.28π, (c) 0.45π, (d) 0.55π, (e) 0.65π.

M 2.3 (a) Write a MATLAB program to generate a sinusoidal sequence $x[n] = A\sin(\omega_o n + \phi)$, and plot the sequence using the `stem` function. The input data specified by the user are the desired length L, amplitude A, the angular frequency ω_o, and the phase ϕ where $0 < \omega_o < \pi$ and $0 \le \phi \le 2\pi$. Using this program, generate the sinusoidal sequences shown in Figure 2.16.

(b) Generate sinsusoidal sequences with the angular frequencies given in Problem 2.31. Determine the period of each sequence from the plot, and verify the result theoretically.

M 2.4 Write a MATLAB program to plot a continuous-time sinusoidal signal and its sampled version, and verify Figure 2.22. You need to use the `hold` function to keep both plots.

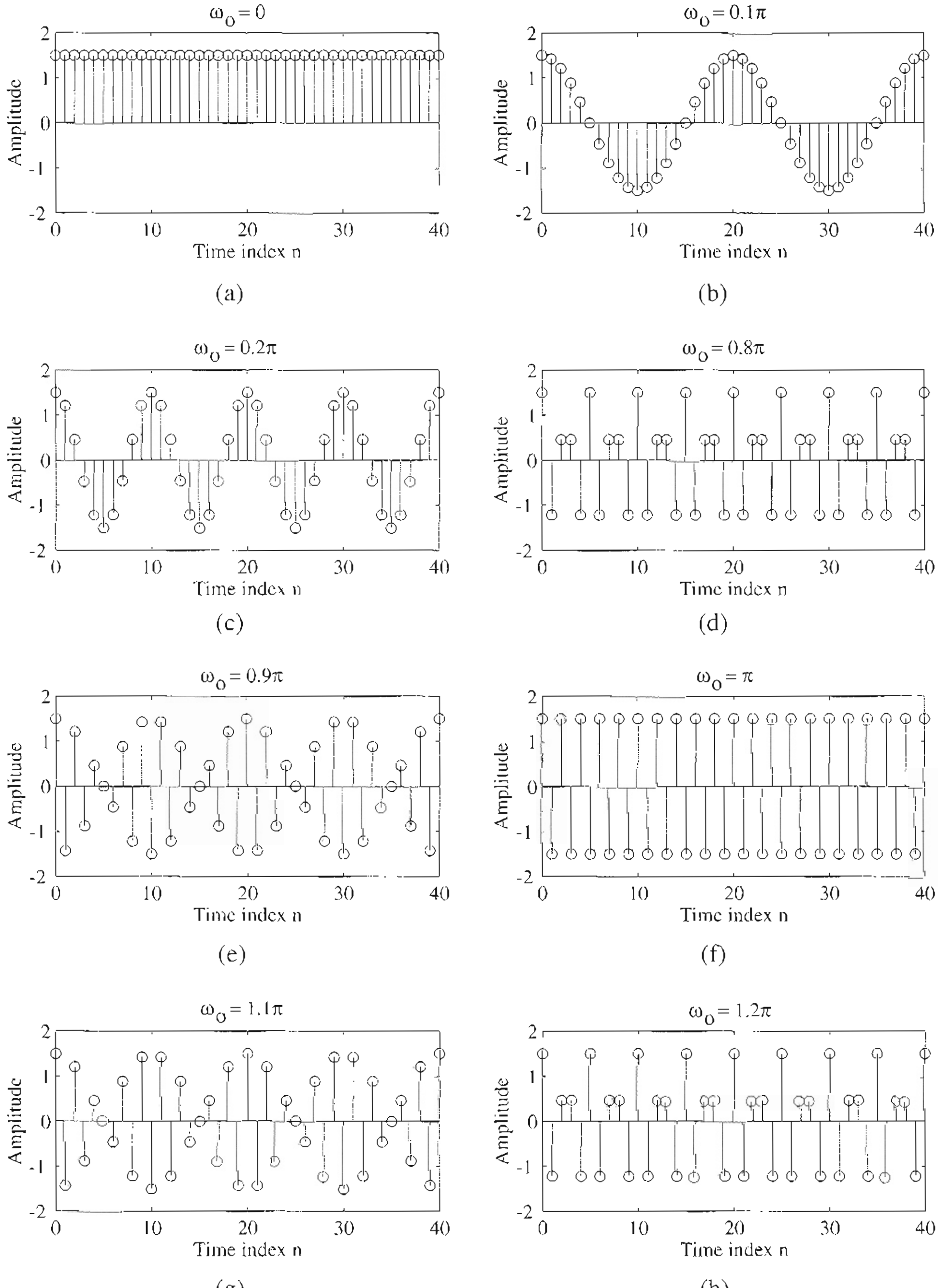

Figure 2.16: A family of sinusoidal sequences given by $x[n] = 1.5 \cos \omega_o n$: (a) $\omega_o = 0$, (b) $\omega_o = 0.1\pi$, (c) $\omega_o = 0.2\pi$, (d) $\omega_o = 0.8\pi$, (e) $\omega_o = 0.9\pi$, (f) $\omega_o = \pi$, (g) $\omega_o = 1.1\pi$, and (h) $\omega_o = 1.2\pi$.

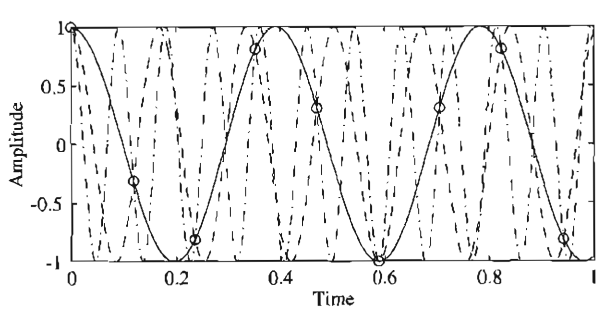

Figure 2.22: Ambiguity in the discrete-time representation of continuous-time signals. $g_1(t)$ is shown with the solid line, $g_2(t)$ is shown with the dashed line, $g_3(t)$ is shown with the dashed-dot line, and the sequence obtained by sampling is shown with circles.