Handwrite part

7.5 Determine the z-transform and its ROC for

$$x[n] = 2\left(\frac{2}{3}\right)^n u[n] - \left(\frac{2}{5}\right)^n u[n]$$

7.6 Find the z-transform of the following signals:

(a) $u[n-m]$

(b) $na^n u[n]$

(c) $a^n \cos \pi n \, u[n]$

7.19 The z-transform of a discrete-time signal $x[n]$ is

$$X(z) = \frac{z-2}{z(z-1)}$$

Calculate $x[0]$, $x[1]$, and $x[10^5]$.

7.21 Using the z-transform, determine the convolution of these sequences:

$$x[n] = [1,\ -1,\ 3,\ 2], \quad h[n] = [1,\ 0,\ 2,\ 1,\ -3].$$

7.25 Obtain the inverse z-transform of

$$X(z) = \frac{z^2 + 2z - 10}{(z-1)(z+2)(z+3)}$$

7.27 Invert each of the following z-transform:

(a) $X_1(z) = \dfrac{1 - z^{-1}}{1 - z^{-1} + 0.75z^{-2}}$

(b) $X_2(z) = \dfrac{1 + z^{-1}}{1 - 0.8z^{-1} + 0.64z^{-2}}$

7.30 The difference equation for a system is

$$y[n]+6y[n-1]+15y[n-2]=0, \quad y[-2]=0, \quad y[-1]=1.$$

Find $y[n]$.

7.36 The transfer function of a discrete-time system is

$$H(z)=\frac{1+2z^{-1}}{1-z^{-1}+z^{-2}}$$

Find the system response $y[n]$ when the input is a unit step function $u[n]$.

7.38 Determine the transfer function of the feedback system represented in Figure 7.14.

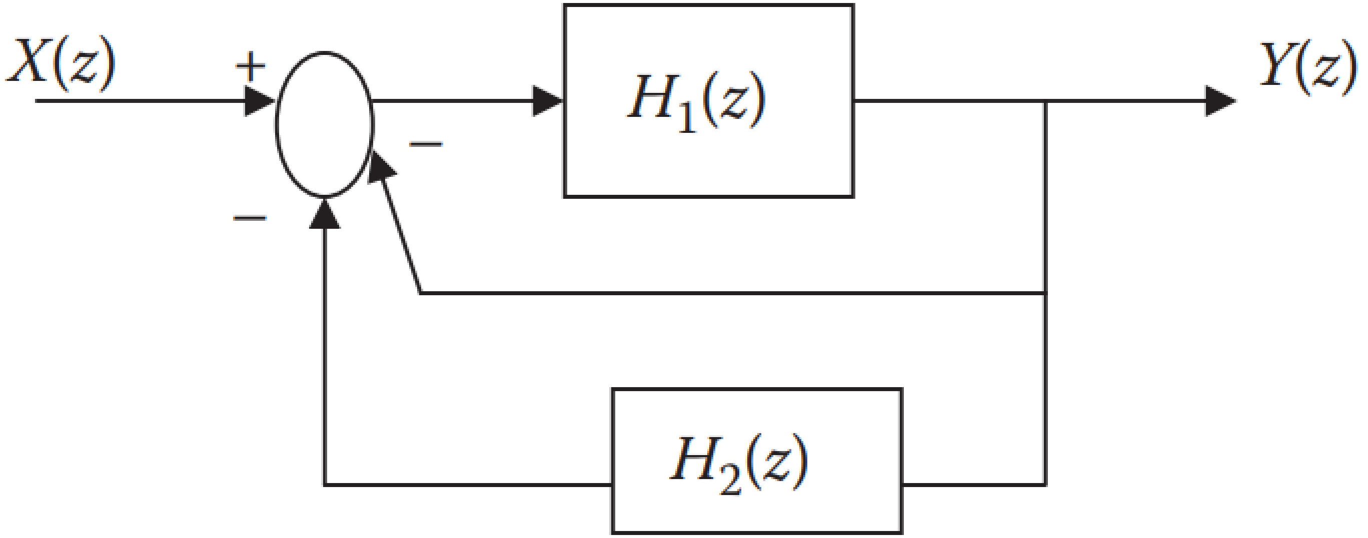

FIGURE 7.14 For Problem 7.38.

7.41 Find the response of a system with a transfer function

$$H(z)=\frac{z-0.6}{(z+0.2)(z-0.8)}$$

and an input $x[n]$ given by

(a) $x[n]=u[n]$

(b) $x[n]=2^n u[n]$

Simulation part

7.45 Use MATLAB to find the inverse z-transform of

$$X(z) = \frac{z}{z - 0.6}$$

7.46 A linear discrete-time system is represented by the transfer function

$$H(z) = \frac{z + 1}{z^3 + 2z^2 + z + 3}$$

Use MATLAB to plot the step response of the system.

7.47 Determine the poles and zeros of the transfer function

$$H(z) = \frac{z^2 + 6z + 1}{z^4 + 3z^3 + 4z + 10}$$

7.49 Determine the stability of the systems represented by the following transfer function:

$$H(z) = \frac{z^3 + 3z^2 + z - 1}{z^4 + 1.25z^3 + 0.5z^2 - 0.375z - 0.2}$$