2

e055717

2007/5/18(   )

1   1.9(a)

$$y(nT) = 2 * x(nT) + x(nT - T) + 0.5 * (nT - 2T) + 0.1 * (nT - 3T)$$

$$-2T = 0, -T = 0, 0 = 1, T = 0, 2T = -1, 3T = 0, 4T = 0$$

$y(0) = 2 \;.\; y(1) = 1 \;.\; y(2) = -1.5 \;.\; y(3) = -0.9 \;.\; y(4) = -0.5 \;.\; y(5) = -0.1$
$y(6) \; y(9) = 0$

2   1.9(b)

$$y(nT) = 2 * x(nT) + x(nT - T) + 0.5 * (nT - 2T) + 0.1 * (nT - 3T)$$

$$-2T = 0, -T = 0, 0 = 1, T = 0, 2T = -1, 3T = 0, 4T = 0$$

$y(0) = 2 \;.\; y(1) = 1 \;.\; y(2) = -1.5 \;.\; y(3) = -0.9 \;.\; y(4) = -0.5 \;.\; y(5) = -0.1$
$y(6) \; y(9) = 0$

3   1.9(c)

$$y(nT) = a_0 x(nT) + a_1 x(nT - T) + a_2 x(nT - 2T) + b_1 y(nT - T) + b_2 y(nT - 2T)$$

$a_0 = 0, a_1 = 0.3236, a_2 = -0.36, b_1 = 1.2944, b_2 = -0.64$

$$y(nT) = 0.3236 * x(nT - T) - 0.36 * x(nT - 2T) + 1.2944 * y(nT - T) - 0.64 * y(nT - 2T)$$

$$-2T = 0, -T = 0, 0 = 1, T = 0, 2T = -1, 3T = 0, 4T = 0$$

$y(0) = 0 \;.\; y(1) = 0.3236 \;.\; y(2) = 0.0588678 \;.\; y(3) = -0.4545055 \;.\; y(4) = -0.2659873$
$y(5) = -0.0534105 \;.\; y(6) = 0.1010974 \;.\; y(7) = 0.1650431 \;.\; y(8) = 0.1489295 \;.\; y(9) = 0.0871468$

3.1   1.9(d)

$$x_1(nT) = x(nT) + b_1 x_1(nT - T) + b_2 x_1(nT - 2T)$$
$$y(nT) = a_0 x_1(nT) + a_1 x_1(nT - T) + a_2 x_1(nT - 2T)$$

$a_0 = 0, a_1 = 0.3236, a_2 = -0.36, b_1 = 1.2944, b_2 = -0.64$

$$x_1(nT) = x(nT) + 1.2944 * x_1(nT - T) - 0.64 * x_1(nT - 2T)$$
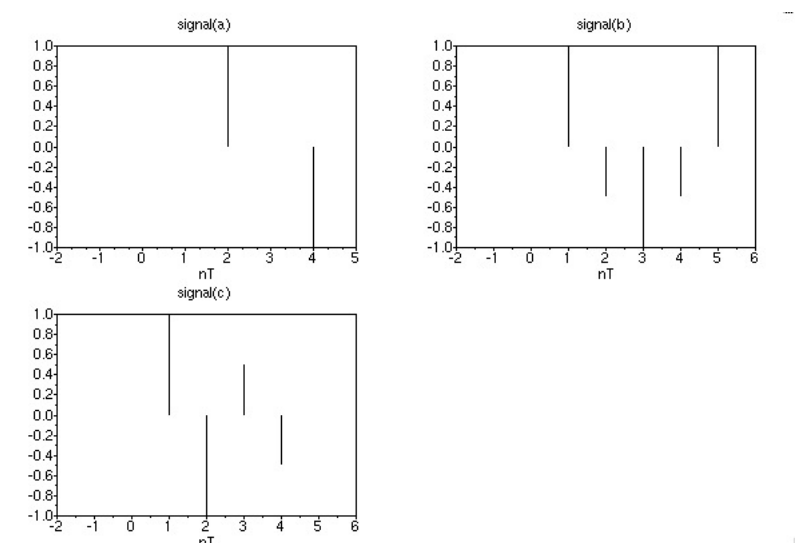$$y(nT) = 0.3236 * x_1(nT - T) - 0.36 * x_1(nT - 2T)$$

$$-2T = 0, -T = 0, 0 = 1, T = 0, 2T = -1, 3T = 0, 4T = 0$$

$y(0) = 0$. $y(1) = 0.3236$. $y(2) = 0.0588678$. $y(3) = -0.4545055$. $y(4) = -0.2659873$
$y(5) = -0.0534105$. $y(6) = 0.1010974$. $y(7) = 0.1650431$. $y(8) = 0.1489295$. $y(9) = 0.0871468$

4   1.11

4.1   1.11(c)

5 問題 1.12

$$y_{(a)}(nT) = x(nT) + x(nT - T) + n(nT - 2T) + n(nT - 3T) + n(nT - 4T)$$

$$y_{(b)}(nT) = x(nT) - x(nT - 5T) + y(nT - T)$$

$$= x(nT) - x(nT - 5T) + \{x(nT - T) - x(nT - 6T) + y(nT - 2T)\}$$

$$= x(nT) - x(nT - 5T) + \{x(nT - T) - x(nT - 6T) + \{x(nT - 2T) - x(nT - 7T) + y(nT - 3T)\}\}$$

$$\vdots$$

$$= x(nT) - x(nT - 5T) + \{x(nT - T) - x(nT - 6T) + \{x(nT - 2T) - x(nT - 7T) + \{x(nT - 3T)$$

$$-x(nT - 8T) + \{x(nT - 4T) - x(nT - 9T) + y(nT - 5T)\}\}\}\}$$

$$= x(nT) + x(nT - T) + x(nT - 2T) + x(nT - 3T) + x(nT - 4T) - x(nT - 5T) - x(nT - 6T)$$

$$-x(nT - 7T) - x(nT - 8T) - x(nT - 9T) + y(nT - 5T)$$

$$= x(nT) + x(nT - T) + x(nT - 2T) + x(nT - 3T) + x(nT - 4T) - \mathbf{x(nT - 5T)} - x(nT - 6T)$$

$$-x(nT - 7T) - x(nT - 8T) - x(nT - 9T) + \mathbf{x(nT - 5T)} - x(nT - 10T) + y(nT - 6T)\}$$

$$= x(nT) + x(nT - T) + x(nT - 2T) + x(nT - 3T) + x(nT - 4T) - x(nT - 6T)$$

$$-x(nT - 7T) - x(nT - 8T) - x(nT - 9T) - x(nT - 10T) + y(nT - 6T)\}$$

$$= x(nT) + x(nT - T) + x(nT - 2T) + x(nT - 3T) + x(nT - 4T)$$

$$-x(nT - 7T) - x(nT - 8T) - x(nT - 9T) - x(nT - 10T) - x(nT - 11T) + y(nT - 7T)\}$$

$$\vdots$$

$$= x(nT) + x(nT - T) + x(nT - 2T) + x(nT - 3T) + x(nT - 4T)$$

$$-x(\infty) - x(\infty + 1) - x(\infty + 2) - x(\infty + 3) - x(\infty + 4) + y(\infty)\}$$

$$x(nT - \infty T)$$

$$= x(nT) + x(nT - T) + x(nT - 2T) + x(nT - 3T) + x(nT - 4T)$$

$$-x(\infty) - x(\infty + 1) - x(\infty + 2) - x(\infty + 3) - x(\infty + 4) + y(\infty)\}$$

$$\simeq x(nT) + x(nT - T) + x(nT - 2T) + x(nT - 3T) + x(nT - 4T)$$

よって (a) も (b) も

6 問題 2.1

6.1 問題 2.1(2)

$$y(nT) = x^2(nT) + x(nT + T)$$

6.1.1

A,B

$$R[Ax_1(nT) + Bx_2(nT)] = \{Ax_1(nT) + Bx_2(nT)\}^2 + \{Ax_1(nT + T) + Bx_2(nT + T)\}$$
$$= A^2x_1^2(nT) + 2ABx_1(nT)x_2(nT) + B^2x_2^2(nT) + Ax_1(nT + T) + Bx_2(nT + T)$$
$$AR[x_1(nT)] + BR[x_2(nT)] = A[x_1^2(nT) + x_1(nT + T)] + B[x_2^2(nT) + x_2(nT + T)]$$
$$= A[x_1^2(nT) + Ax_1(nT + T) + Bx_2^2(nT) + Bx_2(nT + T)$$

6.2   2.1(4)

$$y(nT) = a^n(nT + T)(|a| < 1)$$

6.2.1

A,B

$$R[Ax_1(nT) + Bx_2(nT)] = R[Aa_1^n x(nT - T) + Ba^n x_2(nT - T)]$$
$$= Aa_1^n x(nT - T) + Ba^n x_2(nT - T)$$
$$BR[x_1(nT)] + BR[x_2(nT)] = AR[a_1^n x(nT - T)] + BR[a^n x_2(nT - T)]$$
$$= Aa_1^n x(nT - T) + Ba^n x_2(nT - T)$$

6.3   2.1(6)

$$y(nT) = \{an + x(nT + 2T)\}^2 = a^2n^2 + 2anx(nT + 2T) + x^2(nT + 2T)$$

6.3.1

A,B

$$R[Ax_1(nT) + Bx_2(nT)] = a^2n^2 + 2an[Ax_1(nT + 2T) + Bx_2(nT + 2T)] + [Ax_1(nT + 2T) + Bx_2(nT + 2T)$$
$$BR[x_1(nT)] + BR[x_2(nT)] = A(a^2n^2 + 2anx_1(nT + 2T)...$$

7 2.2

7.1 2.2(b)

$x_1(nT) = x(nT - T)$

$x_2(nT) = x_1(nT - T)$

$y(nT) = \{x(nT) + 2 * x_1(nT)\} + x_2(nT) + \{3 * x(nT) + 4 * x_1(nT)\} = 4 * x(nT) + 6 * x_1(nT) + x_2(nT)$

$\quad = 4 * x(nT) + 6 * x(nT - T) + x(nT - 2T)$

$$y(0) = 4 \ , \ y(1) = 6 \ , \ y(2) = 1 \ . \ y(3) \ (9) = 0$$

7.2 2.2(f)

$x_1(nT) = x(nT - T)$

$x_2 = 3 * \{x(nT - T) + 2 * x_1(nT - T)\}$

$x_3 = 4 * \{x(nT - T) + 2 * x_1(nT - T)\} + x_2(nT - T)$

$y(nT) = 5 * \{x(nT) + 2 * x_1(nT)\} + x_3(nT)$

$\quad = 5 * \{x(nT) + 2 * x_1(nT)\} + 4 * \{x(nT - T) + 2 * x_1(nT - T)\} + x_2(nT - T)$

$\quad = 5 * x(nT) + 10 * x_1(nT) + 4 * x(nT - T) + 8 * x_1(nT - T) + 3 * \{x(nT - 2T) + 2 * x_1(nT - 2T)\}$

$\quad = 5 * x(nT) + 10 * x(nT - T) + 4 * x(nT - T) + 8 * x(nT - 2T) + 3 * x(nT - 2T) + 6 * x(nT - 3T)$

$\quad = 5 * x(nT) + 14 * x(nT - T) + 11 * x(nT - 2T) + 6 * x(nT - 3T)$

$$y(0) = 5 \ , \ y(1) = 14 \ , \ y(2) = 11 \ . \ y(3) = 6 \ . \ y(4) \ y(9) = 0$$

[1]

2004/9/15