3.2 (a) $\int_{-2}^{2} \phi_1(t)\phi_2(t)\,dt = 0$

$\int_{-2}^{2} \phi_2(t)\phi_3(t)\,dt = 0$

$\int_{-2}^{2} \phi_3(t)\phi_1(t)\,dt = 0$

(b) $\int_{-2}^{2} \phi_1(t)\phi_1(t)\,dt = 4A^2$

$\int_{-2}^{2} \phi_2(t)\phi_2(t)\,dt = 4A^2$

$\int_{-2}^{2} \phi_3(t)\phi_3(t)\,dt = 4A^2$

$\Rightarrow 4A^2 = 1 \Rightarrow A = \pm\frac{1}{2}$.

(c) $\chi(t) = \phi_2(t) - \phi_3(t)$.

3.6 (a) $\gamma_0 = \frac{\Delta^2}{2a}\ln\left(\frac{P(S_1)}{P(S_2)}\right) = \frac{0.1}{2} \times \ln\left(\frac{0.5}{0.5}\right) = 0$.

(b) $\gamma_0 = \frac{\Delta^2}{2a}\ln\left(\frac{P(S_1)}{P(S_2)}\right) = \frac{0.1}{2} \times \ln\left(\frac{0.7}{0.3}\right) = 0.042$

(c) $\gamma_0 = \frac{\Delta^2}{2a}\ln\left(\frac{P(S_1)}{P(S_2)}\right) = -\frac{0.1}{2} \times \ln\left(\frac{0.8}{0.2}\right) = -0.069$.

(d) when $P(S_1) = P(S_2)$, $\gamma_0 = 0$

$P(S_1) > P(S_2)$, $P(S_1) - P(S_2) \uparrow$, $\gamma_0 \uparrow$.

$P(S_1) < P(S_2)$, $P(S_1) - P(S_2) \uparrow$, $\gamma_0 \downarrow$.

3.7

$$P_B = P(S_1)\int_{-0.2}^{0} \frac{1}{2}\,dz + P(S_2)\int_{0}^{0.2} \frac{1}{2}\,dz = 0.1$$

3.18.

we have: $\begin{bmatrix} 1 & -0.2 & 0.3 \\ 0.4 & 1 & -0.2 \\ -0.1 & 0.4 & 1 \end{bmatrix} \begin{bmatrix} C_{-1} \\ C_0 \\ C_1 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$

solution: $\begin{bmatrix} C_{-1} \\ C_0 \\ C_1 \end{bmatrix} = \begin{bmatrix} 0.259 \\ 0.835 \\ -0.308 \end{bmatrix}$

and, $y_{-1} = 0$, $y_0 = 1$, $y_1 = 0$

we have, $y_2 = C_{-1}x_3 + C_0 x_2 + C_1 x_1 = -0.1808$

$y_3 = C_0 x_3 + C_1 x_2 = 0.1143$

$y_{-2} = C_{-1} x_{-1} + C_0 x_{-2} + C_1 x_{-3} = 0.1679$

$y_{-3} = C_{-1} x_{-2} + C_0 x_{-3} = 0.1612.$

.abs()

maximum sample amplitude: 0.1808

Sum of intercode crosstalk amplitude: 0.2626.