Übung 4 / 5

Dienstag, 16. November 2010
11:53

Aufg. 1 (Klausur H 2008)

(a) ges: A, B, C, D

2 Eingänge $\longrightarrow p = 2$

2 Speicher $\longrightarrow n = 2$

1 Ausgang $\longrightarrow q = 1$

(i) $x_1(k+1) = u_1(k) + a \cdot u_1(k) + a \cdot u_2(k) + a \cdot x_1(k) + x_2(k)$

(ii) $x_2(k+1) = \underbrace{u_2(k) + u_2(k)}_{= 0 \text{ da } GF(2)} + u_1(k) + x_1(k)$

(iii) $y(k) = x_1(k) + u_1(k) + u_2(k)$

$$\underline{x}(k+1) = \begin{pmatrix} a & 1 \\ 1 & 0 \end{pmatrix} \underline{x}(k) + \begin{pmatrix} 1+a & a \\ 1 & 0 \end{pmatrix} \underline{u}(k)$$

A: $n \times n = 2 \times 2$ B: $n \times p = 2 \times 2$

$$y(k) = \begin{pmatrix} 1 & 0 \end{pmatrix} \underline{x}(k) + \begin{pmatrix} 1 & 1 \end{pmatrix} \underline{u}(k)$$

C: $n \times q = 1 \times 2$ D: $q \times p = 1 \times 2$

(b) ges $G_1(V) = \left. \dfrac{Y(V)}{U_1(V)} \right|_{U_2(V) = 0}$ $a = 1$

(i) $X_1(V) \cdot V^{-1} = X_1(V) + \underbrace{U_1(V) + U_1(V)}_{=0} + X_2(V)$

(ii) $X_2(V) \cdot V^{-1} = X_1(V) + U_1(V)$

(iii) $Y(V) = X_1(V) + U_1(V)$

(iv) aus (ii) $X_2(V) = V X_1(V) + V U_1(V)$

(v) (iv) in (i) $\quad X_1(v)\cdot v^{-1} = X_1(v) + v\cdot X_1(v) + v\,a_1(v)$

$$\Leftrightarrow \quad X_1(v) = vX_1(v) + v^2 X_1(v) + v^2 a_1(v)$$

$$\Leftrightarrow \quad X_1(v) = \frac{a_1(v)\cdot v^2}{1+v+v^2}$$

$$\Rightarrow \quad y(v) = \frac{a_1(v)\cdot v^2 + (1+v+v^2)\,a_1(v)}{1+v+v^2}$$

$$G_1(v) = \frac{y(v)}{a_1(v)} = \underline{\underline{\frac{1+v}{1+v+v^2}}}$$

ges $\quad G_2(v) = \left.\frac{y(v)}{a_2(v)}\right|_{a_1(v)=0} \qquad a=1$

$$\begin{cases} \text{(i)} & x_1(k+1) = x_2(k) + x_1(k) + a_2(k) \\ \text{(ii)} & x_2(k+1) = \underbrace{a_2(k) + a_2(k)}_{=0} + x_1(k) \\ \text{(iii)} & y(k) = a_2(k) + x_1(k) \end{cases}$$

$$\begin{cases} \text{(i)} & X_1(v)\cdot v^{-1} = X_2(v) + X_1(v) + a_2(v) \\ \text{(ii)} & X_2(v)\,v^{-1} = X_1(v) \Leftrightarrow X_2(v) = v\cdot X_1(v) \\ \text{(iii)} & y(v) = a_2(v) + X_1(v) \end{cases}$$

(iv) (ii) in (i) $\quad \Rightarrow \quad X_1(v) = \frac{v\cdot a_2(v)}{1+v+v^2}$

$$\Rightarrow \quad y(v) = \frac{a_2(v)\,(1+v+v^2) + v\,(a_2(v))}{1+v+v^2}$$

$$\Rightarrow \quad G_2(v) = \underline{\underline{\frac{1+v^2}{1+v+v^2}}}$$

c) jetzt gilt:

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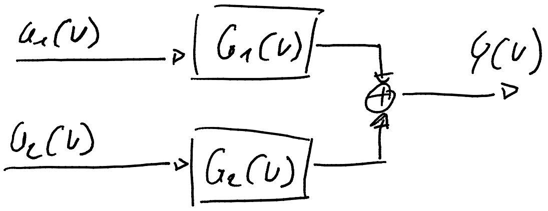
$$G_2(v) = \frac{1}{1+v+v^2}$$



$$y(v) = U_1(v) \cdot \underbrace{\frac{v+1}{v^2+v+1}}_{G_1} + U_2(v) \cdot \underbrace{\frac{1}{1+v^2+v}}_{G_2}$$

Eingang $\{u_1(k)\} = \{\bar{1}\}$ $\quad U_1(v) = \frac{1}{1+v}$

$\circ\!\!-\!\!\bullet$

$$U_1(v) = 1 + \cancel{v} + \cancel{v^2} + \dots$$
$$+ \; v \cdot U_1(v) = \cancel{v} + v^2 + \dots$$

$$(1+v)U_1(v) = 1 \iff U_1(v) = \frac{1}{1+v}$$

Ausgang $\{y(k)\} = \{1, 0, 1, \bar{0}\}$

$\circ\!\!-\!\!\bullet$

$$y(v) = 1 + v^2$$

$$\underbrace{1+v^2}_{y(v)} = \underbrace{\frac{1}{\cancel{v+1}}}_{U_1(v)} \frac{\cancel{v+1}}{v^2+v+1} + U_2(v) \frac{1}{1+v+v^2}$$

$$\iff 1+v^2 = \frac{1 + U_2(v)}{1+v+v^2}$$

$$\iff (1+v^2)(1+v+v^2) = 1 + U_2(v)$$

$$\iff 1 + v + v^2 + v^2 + v^3 + v^4 = 1 + U_1(v)$$

$$\Rightarrow \quad u_2(v) = v + v^3 + v^4$$

$$\{u_2(k)\} = \{0, 1, 0, 1, 1, \overline{0}\}$$

Aufg. 2

{Lösung im LZP}