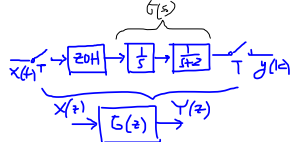
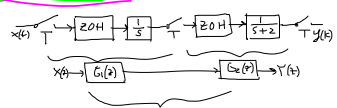


Contoh soal 1.



Diketahui: $x(t) = u(t) \rightarrow u(k) \begin{cases} = 0, k < 0 \\ = 1, k \geq 0 \end{cases}$
 $T = 1 \text{ sec}$
 Tentukan $y(k), k = 0, 1, 2, \dots$

$$G_1(z) = \frac{z-1}{z} \left[\frac{1}{s^2} \right] = \frac{z-1}{z} \left[\frac{1}{(z-1)^2} \right] = \frac{1}{z-1}$$

$$G_2(z) = \frac{z-1}{z} \left[\frac{1}{s(s+2)} \right] = \frac{z-1}{z} \left[\frac{1}{z} \left(\frac{1}{s} - \frac{1}{s+2} \right) \right] = \frac{1}{z} \left[\frac{1}{s} - \frac{1}{s+2} \right]$$

$$G(z) = G_1(z) \cdot G_2(z) = \frac{1}{z-1} \cdot \frac{0,4323}{z-1,1353z + 0,1353} = \frac{0,4323}{z^2 - 1,1353z + 0,1353}$$

$$X(z) = \sum x(k) = \sum u(k) = \frac{z}{z-1}$$

$$Y(z) = G(z) \cdot X(z) = \frac{0,4323z}{(z-1)(z^2 - 1,1353z + 0,1353)} = \frac{0,4323z}{z^3 - 2,1353z^2 + 1,2706z - 0,1353}$$

Untuk menentukan $y(k)$, ada 2 (dua) cara:

(1) Pembagian.

$$z^3 - 2,1353z^2 + 1,2706z - 0,1353 \mid 0,4323z$$

k	x(k)	y(k)
0	1	0
1	1	0
2	1	0,4323
3	1	0,9231
4	1	1,4218
5	1	1,9216

$$\begin{array}{r} 0,4323z^2 + 0,9231z^3 + 1,4218z^4 + 1,9216z^5 \\ 0,4323z \\ \hline 0,9231z - 0,5493z^{-1} + 0,0585z^{-2} \\ 0,9231z - 1,9711z^{-1} + 1,1729z^{-2} - 0,1249z^{-3} \\ \hline 1,4218z^{-1} - 1,1144z^{-2} + 0,1249z^{-3} \\ 1,4218z^{-1} - 3,0360z^{-2} + 1,8065z^{-3} - 0,11924z^{-4} \\ \hline 1,9216z^{-2} \end{array}$$

Excel

(2) Pers. difference

$$G(z) = \left[\frac{0,4323}{z^2 - 1,1353z + 0,1353} \right] z^{-2}$$

$$\frac{Y(z)}{X(z)} = \frac{0,4323z^{-2}}{1 - 1,1353z^{-1} + 0,1353z^{-2}}$$

kali silang:

$$(1 - 1,1353z^{-1} + 0,1353z^{-2}) Y(z) = 0,4323z^{-2} X(z)$$

$$Y(z) = 0,4323z^{-2} X(z) + 1,1353z^{-1} Y(z) - 0,1353z^{-2} Y(z)$$

Inverse transf. Z:

$$Y(k) = 0,4323x(k-2) + 1,1353Y(k-1) - 0,1353Y(k-2)$$

-1

k	x(k)	y(k)
0	1	0
1	1	0
2	1	0,4323
3	1	0,9231
4	1	1,4218
5	1	1,9216

excel

$$\begin{aligned} G(z) &= \frac{z-1}{z} \left[\frac{1}{s^2(s+2)} \right] \\ &= \frac{z-1}{z} \left[\frac{1}{z} \left(\frac{1}{s^2} - \frac{2}{s} + \frac{1}{s+2} \right) \right] \\ &= \frac{1}{z} \left[\frac{1}{s^2} - \frac{2}{s} + \frac{1}{s+2} \right] \\ &= \frac{1}{z} \left[\frac{0,8647z + 0,5940}{z^2 - 1,1353z + 0,1353} \right] \\ &= \frac{0,8647z + 0,5940}{z^2 - 1,1353z + 0,1353} \end{aligned}$$

$$\rightarrow X(z) = \sum x(k) = \sum u(k) = \frac{z}{z-1}$$

$$Y(z) = G(z) \cdot X(z)$$

Pembagian		Pers Diff	
k	x(k)	y(k)	y(k)
0	1	0	0,2162
1	1	0,2162	0,6101
2	1	0,6101	1,0288
3	1	1,0288	1,4495
4	1	1,4495	1,8710
5	1	1,8710	

100%