



BSM307

İşaretler ve Sistemler

Dr. Seçkin Arı

Ters z-Dönüşümü

- Ters z-Dönüşümü
- z-Domeninde Sistem Analizi

Ters z-Dönüşümü

- $\mathcal{Z}^{-1}\{X(z)\} = x(n)$
- Residü Yöntemi
- Kuvvet Seri Açılımı
- Kısmi Kesirlere Ayırma

Residü Yöntemi

- Kutup
 - ◆ Fonksiyonun paydasını sıfır yapan değişken değeri
- Sıfır
 - ◆ Fonksiyonun payını sıfır yapan değişken değeri

Residü Yöntemi

1. $X(z) = \frac{A(z)}{(z-p_j)^k \prod_i (z-p_i)}$ biliniyor ise

Residü Yöntemi

1. $X(z) = \frac{A(z)}{(z-p_j)^k \prod_i (z-p_i)}$ biliniyor ise

2. $X(z)z^{n-1}$ bulunur. $X(z)z^{n-1} = \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)}$

Residü Yöntemi

1. $X(z) = \frac{A(z)}{(z-p_j)^k \prod_i (z-p_i)}$ biliniyor ise

2. $X(z)z^{n-1}$ bulunur. $X(z)z^{n-1} = \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)}$

3. Tüm kutuplar bulunur.

- ♦ p_i' ler tek katlı
- ♦ p_j , k katlı

Residü Yöntemi

1. $X(z) = \frac{A(z)}{(z-p_j)^k \prod_i (z-p_i)}$ biliniyor ise
2. $X(z)z^{n-1}$ bulunur. $X(z)z^{n-1} = \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)}$
3. Tüm kutuplar bulunur.
 - ♦ p_i' ler tek katlı
 - ♦ p_j , k katlı
4. Her bir kutba ait residü hesaplanır. (p_m, p_i' lerden biri olmak üzere)
 - ♦ $\text{Res}_{p_m} = (z - p_m) \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)} \Big|_{z=p_m}$, p_m tek katlı

Residü Yöntemi

1. $X(z) = \frac{A(z)}{(z-p_j)^k \prod_i (z-p_i)}$ biliniyor ise

2. $X(z)z^{n-1}$ bulunur. $X(z)z^{n-1} = \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)}$

3. Tüm kutuplar bulunur.

- ♦ p_i' ler tek katlı
- ♦ p_j , k katlı

4. Her bir kutba ait residü hesaplanır.

♦ $\text{Res}_m = (z - p_m) \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)} \Big|_{z=p_m} = \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_{i \neq m} (z-p_i)} \Big|_{z=p_m}$, p_m tek katlı

♦ $\text{Res}_j = \frac{1}{(k-1)!} \frac{\partial^{k-1}}{\partial z^{k-1}} \left((z - p_j)^k \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)} \right) \Big|_{z=p_j}$, p_j , k katlı

Residü Yöntemi

1. $X(z) = \frac{A(z)}{(z-p_j)^k \prod_i (z-p_i)}$ biliniyor ise
2. $X(z)z^{n-1}$ bulunur. $X(z)z^{n-1} = \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)}$
3. Tüm kutuplar bulunur.
 - ♦ p_i' ler tek katlı
 - ♦ p_j , k katlı
4. Her bir kutba ait residü hesaplanır.
 - ♦ $\text{Res}_m = (z - p_m) \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)} \Big|_{z=p_m} = \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_{i \neq m} (z-p_i)} \Big|_{z=p_m}$, p_m tek katlı
 - ♦ $\text{Res}_j = \frac{1}{(k-1)!} \frac{\partial^{k-1}}{\partial z^{k-1}} \left((z - p_j)^k \frac{A(z)z^{n-1}}{(z-p_j)^k \prod_i (z-p_i)} \right) \Big|_{z=p_j} = \frac{1}{(k-1)!} \frac{\partial^{k-1}}{\partial z^{k-1}} \left(\frac{A(z)z^{n-1}}{\prod_i (z-p_i)} \right) \Big|_{z=p_j}$, p_j , k katlı
5. $x(n) = \text{Res}_j + \sum_i \text{Res}_i$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n \geq 0$ iken $z = a$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n \geq 0$ iken $z = a$ da kutup
- $\text{Res} = (z - a) \frac{z^n}{z-a} \Big|_{z=a} =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n \geq 0$ iken $z = a$ da kutup
- $\text{Res} = (z - a) \frac{z^n}{z-a} \Big|_{z=a} = z^n \Big|_{z=a} =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n \geq 0$ iken $z = a$ da kutup
- $\text{Res} = (z - a) \frac{z^n}{z-a} \Big|_{z=a} = z^n \Big|_{z=a} = a^n$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n \geq 0$ iken $z = a$ da kutup
- $\text{Res} = (z - a) \frac{z^n}{z-a} \Big|_{z=a} = z^n \Big|_{z=a} = a^n$
- $n \geq 0$ iken $x(n) = a^n$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -1$ iken $X(z) =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -1$ iken $X(z) = \frac{1}{z(z-a)},$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -1$ iken $X(z) = \frac{1}{z(z-a)}$, $z_1 = a$ ve $z_2 = 0$ da kutup
- $\text{Res}_a = (z-a) \frac{1}{z(z-a)} \Big|_{z=a} =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -1$ iken $X(z) = \frac{1}{z(z-a)}$, $z_1 = a$ ve $z_2 = 0$ da kutup
- $\text{Res}_a = (z-a) \frac{1}{z(z-a)} \Big|_{z=a} = \frac{1}{z} \Big|_{z=a} = \frac{1}{a}$
- $\text{Res}_0 =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -1$ iken $X(z) = \frac{1}{z(z-a)}$, $z_1 = a$ ve $z_2 = 0$ da kutup
- $\text{Res}_a = (z-a) \frac{1}{z(z-a)} \Big|_{z=a} = \frac{1}{z} \Big|_{z=a} = \frac{1}{a}$
- $\text{Res}_0 = (z-0) \frac{1}{z(z-a)} \Big|_{z=0} =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -1$ iken $X(z) = \frac{1}{z(z-a)}$, $z_1 = a$ ve $z_2 = 0$ da kutup
- $\text{Res}_a = (z-a) \frac{1}{z(z-a)} \Big|_{z=a} = \frac{1}{z} \Big|_{z=a} = \frac{1}{a}$
- $\text{Res}_0 = z \frac{1}{z(z-a)} \Big|_{z=0} = \frac{1}{z-a} \Big|_{z=0} = -\frac{1}{a}$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -1$ iken $X(z) = \frac{1}{z(z-a)}$, $z_1 = a$ ve $z_2 = 0$ da kutup
- $\text{Res}_a = (z-a) \frac{1}{z(z-a)} \Big|_{z=a} = \frac{1}{z} \Big|_{z=a} = \frac{1}{a}$
- $\text{Res}_0 = z \frac{1}{z(z-a)} \Big|_{z=0} = \frac{1}{z-a} \Big|_{z=0} = -\frac{1}{a}$
- $n = -1$ için $x(n) = x(-1) =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -1$ iken $X(z) = \frac{1}{z(z-a)}$, $z_1 = a$ ve $z_2 = 0$ da kutup
- $\text{Res}_a = (z-a) \frac{1}{z(z-a)} \Big|_{z=a} = \frac{1}{z} \Big|_{z=a} = \frac{1}{a}$
- $\text{Res}_0 = z \frac{1}{z(z-a)} \Big|_{z=0} = \frac{1}{z-a} \Big|_{z=0} = -\frac{1}{a}$
- $n = -1$ için $x(n) = x(-1) = \text{Res}_a + \text{Res}_0 = \frac{1}{a} - \frac{1}{a} = 0$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)},$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)}$, $z_1 = a$ 'da tek ve $z_2 = 0$ da çift katlı kutup
- $\text{Res}_a =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)}$, $z_1 = a$ 'da tek ve $z_2 = 0$ da çift katlı kutup
- $\text{Res}_a = (z-a) \frac{1}{z^2(z-a)} \Big|_{z=a} =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)}$, $z_1 = a$ 'da tek ve $z_2 = 0$ da çift katlı kutup
- $\text{Res}_a = (z-a) \frac{1}{z^2(z-a)} \Big|_{z=a} = \frac{1}{z^2} \Big|_{z=a} = \frac{1}{a^2}$
- $\text{Res}_0 =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)}$, $z_1 = a$ 'da tek ve $z_2 = 0$ da çift katlı kutup
- $\text{Res}_a = (z-a) \frac{1}{z^2(z-a)} \Big|_{z=a} = \frac{1}{z^2} \Big|_{z=a} = \frac{1}{a^2}$
- $\text{Res}_0 = \frac{1}{1!} \frac{\partial}{\partial z} \left(z^2 \frac{1}{z^2(z-a)} \right) \Big|_{z=0} =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)}$, $z_1 = a$ 'da tek ve $z_2 = 0$ da çift katlı kutup
- $\text{Res}_a = (z-a) \frac{1}{z^2(z-a)} \Big|_{z=a} = \frac{1}{z^2} \Big|_{z=a} = \frac{1}{a^2}$
- $\text{Res}_0 = \frac{1}{1!} \frac{\partial}{\partial z} \left(z^2 \frac{1}{z^2(z-a)} \right) \Big|_{z=0} = \frac{\partial}{\partial z} \left(\frac{1}{(z-a)} \right) \Big|_{z=0} =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)}$, $z_1 = a$ 'da tek ve $z_2 = 0$ da çift katlı kutup
- $\text{Res}_a = (z-a) \frac{1}{z^2(z-a)} \Big|_{z=a} = \frac{1}{z^2} \Big|_{z=a} = \frac{1}{a^2}$
- $\text{Res}_0 = \frac{1}{1!} \frac{\partial}{\partial z} \left(z^2 \frac{1}{z^2(z-a)} \right) \Big|_{z=0} = \frac{\partial}{\partial z} \left(\frac{1}{(z-a)} \right) \Big|_{z=0} = \frac{-1}{(z-a)^2} \Big|_{z=0} = -\frac{1}{a^2}$
- $n = -2$ için $x(n) = x(-2) =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)}$, $z_1 = a$ 'da tek ve $z_2 = 0$ da çift katlı kutup
- $\text{Res}_a = (z-a) \frac{1}{z^2(z-a)} \Big|_{z=a} = \frac{1}{z^2} \Big|_{z=a} = \frac{1}{a^2}$
- $\text{Res}_0 = \frac{1}{1!} \frac{\partial}{\partial z} \left(z^2 \frac{1}{z^2(z-a)} \right) \Big|_{z=0} = \frac{\partial}{\partial z} \left(\frac{1}{(z-a)} \right) \Big|_{z=0} = \frac{-1}{(z-a)^2} \Big|_{z=0} = -\frac{1}{a^2}$
- $n = -2$ için $x(n) = x(-2) = \text{Res}_a + \text{Res}_0 = \frac{1}{a^2} - \frac{1}{a^2} = 0$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $X(z) = \frac{z}{z-a} \rightarrow X(z)z^{n-1} = \frac{z^n}{z-a}$
- $n = -2$ iken $X(z) = \frac{1}{z^2(z-a)}$, $z_1 = a$ 'da tek ve $z_2 = 0$ da çift katlı kutup
- $\text{Res}_a = (z-a) \frac{1}{z^2(z-a)} \Big|_{z=a} = \frac{1}{z^2} \Big|_{z=a} = \frac{1}{a^2}$
- $\text{Res}_0 = \frac{1}{1!} \frac{\partial}{\partial z} \left(z^2 \frac{1}{z^2(z-a)} \right) \Big|_{z=0} = \frac{\partial}{\partial z} \left(\frac{1}{(z-a)} \right) \Big|_{z=0} = \frac{-1}{(z-a)^2} \Big|_{z=0} = -\frac{1}{a^2}$
- $n = -2$ için $x(n) = x(-2) = \text{Res}_a + \text{Res}_0 = \frac{1}{a^2} - \frac{1}{a^2} = 0$
- $n < 0$ iken $x(n) = 0$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $n \geq 0$ iken $x(n) = a^n$
- $n < 0$ iken $x(n) = 0$
- $x(n) =$

Örnek 1

- $X(z) = \frac{1}{1-az^{-1}}$ ise $x(n) = ?$
- $n \geq 0$ iken $x(n) = a^n$
- $n < 0$ iken $x(n) = 0$
- $x(n) = a^n u(n)$

Kuvvet Seri Açılımı

- $X(z) = \frac{A(z)}{B(z)}$ ve YB biliniyorsa

Kuvvet Seri Açılımı

- $X(z) = \frac{A(z)}{B(z)}$ ve YB biliniyorsa
- Fonksiyon bölmesi $A(z) \overline{B(z)} \bigg| C(z)$

Kuvvet Seri Açılımı

- $X(z) = \frac{A(z)}{B(z)}$ ve YB biliniyorsa
- Fonksiyon bölmesi
$$A(z) \left| \begin{array}{l} B(z) \\ \hline C(z) \end{array} \right.$$
- YB' ye göre $C(z)$ bulunur.
 - ♦ YB: $|z| > |\alpha|$ ise $C(z)$, z^{-} ' li terimlerden oluşmalı.
 - ♦ YB: $|z| < |\alpha|$ ise $C(z)$, z^{+} ' li terimlerden oluşmalı.

Kuvvet Seri Açılımı

- $X(z) = \frac{A(z)}{B(z)}$ ve YB biliniyorsa
- Fonksiyon bölmesi $A(z) \left| \begin{array}{l} B(z) \\ \hline C(z) \end{array} \right.$
- YB' ye göre $C(z)$ bulunur.
 - ♦ YB: $|z| > |\alpha|$ ise $C(z)$, z^{-} li terimlerden oluşmalı.
 - ♦ YB: $|z| < |\alpha|$ ise $C(z)$, z^{+} li terimlerden oluşmalı.
- $C(z) = \sum_n x(n) z^{-n}$ şeklinde örüntü varsa

Kuvvet Seri Açılımı

- $X(z) = \frac{A(z)}{B(z)}$ ve YB biliniyorsa
- Fonksiyon bölmesi $A(z) \left| \begin{array}{l} B(z) \\ \hline C(z) \end{array} \right.$
- YB' ye göre $C(z)$ bulunur.
 - ♦ YB: $|z| > |\alpha|$ ise $C(z)$, z^{-} li terimlerden oluşmalı.
 - ♦ YB: $|z| < |\alpha|$ ise $C(z)$, z^{+} li terimlerden oluşmalı.
- $C(z) = \sum_n x(n) z^{-n}$ şeklinde örüntü varsa
- Örüntü yoksa, terimlerin ayrı ayrı tersi alınır.

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$1 \quad \left| \frac{1 - az^{-1}}{\phantom{1 - az^{-1}}} \right.$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l} 1 & 1 - az^{-1} \\ 1 - az^{-1} & 1 \\ \hline az^{-1} & \end{array}$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l} 1 & 1 - az^{-1} \\ 1 - az^{-1} & \hline az^{-1} & 1 + az^{-1} \\ az^{-1} - a^2z^{-2} & \\ \hline a^2z^{-2} & \end{array}$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l} 1 & 1 - az^{-1} \\ 1 - az^{-1} & \hline az^{-1} & 1 + az^{-1} + a^2z^{-2} \\ az^{-1} - a^2z^{-2} & \\ a^2z^{-2} & \\ a^2z^{-2} - a^3z^{-3} & \\ a^3z^{-3} & \end{array}$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l} 1 & 1 - az^{-1} \\ 1 - az^{-1} & \hline az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\ az^{-1} - a^2z^{-2} & \\ a^2z^{-2} & \\ a^2z^{-2} - a^3z^{-3} & \\ a^3z^{-3} & \\ \vdots & \end{array}$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & 1 - az^{-1} \\
 1 - az^{-1} & \hline
 az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\
 az^{-1} - a^2z^{-2} & \\
 a^2z^{-2} & \\
 a^2z^{-2} - a^3z^{-3} & \\
 a^3z^{-3} & \\
 \vdots &
 \end{array}$$

$$\bullet X(z) =$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & 1 - az^{-1} \\
 1 - az^{-1} & \hline
 az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\
 az^{-1} - a^2z^{-2} & \\
 a^2z^{-2} & \\
 a^2z^{-2} - a^3z^{-3} & \\
 a^3z^{-3} & \\
 \vdots &
 \end{array}$$

$$\bullet X(z) = 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & 1 - az^{-1} \\
 1 - az^{-1} & \hline
 az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\
 az^{-1} - a^2z^{-2} & \\
 a^2z^{-2} & \\
 a^2z^{-2} - a^3z^{-3} & \\
 a^3z^{-3} & \\
 \vdots &
 \end{array}$$

$$• X(z) = 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots$$

$$• X(z) = \sum_{n=0}^{\infty} \boxed{} z^{-n}$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l} 1 & 1 - az^{-1} \\ 1 - az^{-1} & \hline az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\ az^{-1} - a^2z^{-2} & \\ a^2z^{-2} & \\ a^2z^{-2} - a^3z^{-3} & \\ a^3z^{-3} & \\ \vdots & \end{array}$$

- $X(z) = 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots$

- $X(z) = \sum_{n=0}^{\infty} a^n z^{-n}$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & 1 - az^{-1} \\
 1 - az^{-1} & \hline
 az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\
 az^{-1} - a^2z^{-2} & \\
 a^2z^{-2} & \\
 a^2z^{-2} - a^3z^{-3} & \\
 a^3z^{-3} & \\
 \vdots &
 \end{array}$$

$$• X(z) = 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots$$

$$• X(z) = \sum_{n=0}^{\infty} a^n z^{-n} = \sum_n x(n)z^{-n}$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & 1 - az^{-1} \\
 1 - az^{-1} & \hline
 az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\
 az^{-1} - a^2z^{-2} & \\
 a^2z^{-2} & \\
 a^2z^{-2} - a^3z^{-3} & \\
 a^3z^{-3} & \\
 \vdots &
 \end{array}$$

$$• X(z) = 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots$$

$$• X(z) = \sum_{n=0}^{\infty} a^n z^{-n} = \sum_n x(n) z^{-n}$$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & 1 - az^{-1} \\
 1 - az^{-1} & \hline
 az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\
 az^{-1} - a^2z^{-2} & \\
 a^2z^{-2} & \\
 a^2z^{-2} - a^3z^{-3} & \\
 a^3z^{-3} & \\
 \vdots &
 \end{array}$$

- $X(z) = 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots$
- $X(z) = \sum_{n=0}^{\infty} a^n z^{-n} = \sum_n x(n) z^{-n}$
- $x(n) = a^n$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & 1 - az^{-1} \\
 1 - az^{-1} & \hline
 az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\
 az^{-1} - a^2z^{-2} & \\
 a^2z^{-2} & \\
 a^2z^{-2} - a^3z^{-3} & \\
 a^3z^{-3} & \\
 \vdots &
 \end{array}$$

- $X(z) = 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots$
- $X(z) = \sum_{n=0}^{\infty} a^n z^{-n} = \sum_n x(n) z^{-n}$
- $x(n) = a^n$

Örnek 2

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| > |a|$ ise $x(n) = ?$
- YB: $|z| > |a| \lesssim x(n)$ sağ taraflı
 - ♦ $X(z) = \sum_{n \geq 0} x(n)z^{-n} = \dots + x(k)z^{-k} + \dots$
- Fonksiyon bölmesi en büyük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & 1 - az^{-1} \\
 1 - az^{-1} & \hline
 az^{-1} & 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots \\
 az^{-1} - a^2z^{-2} & \\
 a^2z^{-2} & \\
 a^2z^{-2} - a^3z^{-3} & \\
 a^3z^{-3} & \\
 \vdots &
 \end{array}$$

- $X(z) = 1 + az^{-1} + a^2z^{-2} + a^3z^{-3} + \dots$
- $X(z) = \sum_{n=0}^{\infty} a^n z^{-n} = \sum_n x(n) z^{-n}$
- $x(n) = a^n u(n)$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r} 1 \\ \hline -az^{-1} + 1 \end{array}$$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l} 1 & -az^{-1} + 1 \\ 1 - a^{-1}z & -a^{-1}z \\ \hline a^{-1}z & \end{array}$$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l} 1 & -az^{-1} + 1 \\ 1 - a^{-1}z & \hline a^{-1}z & -a^{-1}z - a^{-2}z^2 \\ a^{-1}z - a^{-2}z^2 & \hline a^{-2}z^2 & \end{array}$$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n<0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l} 1 & -az^{-1} + 1 \\ 1 - a^{-1}z & \hline a^{-1}z & -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 \\ a^{-1}z - a^{-2}z^2 & \\ \hline a^{-2}z^2 & \\ a^{-2}z^2 - a^{-3}z^3 & \\ \hline a^{-3}z^3 & \end{array}$$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

1	$-az^{-1} + 1$
$1 - a^{-1}z$	$-a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots$
<hr style="border: none; border-top: 1px solid black;"/>	
$a^{-1}z$	
$a^{-1}z - a^{-2}z^2$	
<hr style="border: none; border-top: 1px solid black;"/>	
$a^{-2}z^2$	
$a^{-2}z^2 - a^{-3}z^3$	
<hr style="border: none; border-top: 1px solid black;"/>	
$a^{-3}z^3$	
\vdots	

• $X(z) =$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & -az^{-1} + 1 \\
 1 - a^{-1}z & \hline
 a^{-1}z & -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots \\
 a^{-1}z - a^{-2}z^2 & \\
 \hline
 a^{-2}z^2 & \\
 a^{-2}z^2 - a^{-3}z^3 & \\
 \hline
 a^{-3}z^3 & \\
 \vdots &
 \end{array}$$

- $X(z) = -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots$

- $X(z) = \sum_{n=-1}^{-\infty} \boxed{} z^{-n}$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & -az^{-1} + 1 \\
 \hline
 1 - a^{-1}z & -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots \\
 \hline
 a^{-1}z & \\
 a^{-1}z - a^{-2}z^2 & \\
 \hline
 a^{-2}z^2 & \\
 a^{-2}z^2 - a^{-3}z^3 & \\
 \hline
 a^{-3}z^3 & \\
 \vdots &
 \end{array}$$

- $X(z) = -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots$

- $X(z) = \sum_{n=-1}^{-\infty} -(a)^n z^{-n}$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n<0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & -az^{-1} + 1 \\
 1 - a^{-1}z & \hline
 a^{-1}z & -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots \\
 a^{-1}z - a^{-2}z^2 & \\
 a^{-2}z^2 & \\
 a^{-2}z^2 - a^{-3}z^3 & \\
 a^{-3}z^3 & \\
 \vdots &
 \end{array}$$

- $X(z) = -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots$
- $X(z) = \sum_{n=-1}^{-\infty} -(a)^n z^{-n} = \sum_n x(n)z^{-n}$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & -az^{-1} + 1 \\
 \hline
 1 - a^{-1}z & -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots \\
 \hline
 a^{-1}z & \\
 a^{-1}z - a^{-2}z^2 & \\
 \hline
 a^{-2}z^2 & \\
 a^{-2}z^2 - a^{-3}z^3 & \\
 \hline
 a^{-3}z^3 & \\
 \vdots &
 \end{array}$$

- $X(z) = -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots$
- $X(z) = \sum_{n=-1}^{-\infty} -(a)^n z^{-n} = \sum_n x(n) z^{-n}$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & -az^{-1} + 1 \\
 \hline
 1 - a^{-1}z & -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots \\
 \hline
 a^{-1}z & \\
 a^{-1}z - a^{-2}z^2 & \\
 \hline
 a^{-2}z^2 & \\
 a^{-2}z^2 - a^{-3}z^3 & \\
 \hline
 a^{-3}z^3 & \\
 \vdots &
 \end{array}$$

- $X(z) = -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots$
- $X(z) = \sum_{n=-1}^{-\infty} -(a)^n z^{-n} = \sum_n x(n) z^{-n}$
- $x(n) = -(a)^n$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & -az^{-1} + 1 \\
 1 - a^{-1}z & \hline
 a^{-1}z & -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots \\
 a^{-1}z - a^{-2}z^2 & \\
 a^{-2}z^2 & \\
 a^{-2}z^2 - a^{-3}z^3 & \\
 a^{-3}z^3 & \\
 \vdots &
 \end{array}$$

- $X(z) = -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots$
- $X(z) = \sum_{n=-1}^{-\infty} -(a)^n z^{-n} = \sum_n x(n) z^{-n}$
- $x(n) = -(a)^n$

Örnek 3

- $X(z) = \frac{1}{1-az^{-1}}$ ve YB: $|z| < |a|$ ise $x(n) = ?$
- YB: $|z| < |a| \lesssim x(n)$ sol taraflı
 - ♦ $X(z) = \sum_{n < 0} x(n)z^{-n} = \dots + x(k)z^k + \dots$
- Fonksiyon bölmesi en küçük dereceli terimden başlar.

$$\begin{array}{r|l}
 1 & -az^{-1} + 1 \\
 \hline
 1 - a^{-1}z & -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots \\
 \hline
 a^{-1}z & \\
 a^{-1}z - a^{-2}z^2 & \\
 \hline
 a^{-2}z^2 & \\
 a^{-2}z^2 - a^{-3}z^3 & \\
 \hline
 a^{-3}z^3 & \\
 \vdots &
 \end{array}$$

- $X(z) = -a^{-1}z - a^{-2}z^2 - a^{-3}z^3 + \dots$
- $X(z) = \sum_{n=-1}^{-\infty} -(a)^n z^{-n} = \sum_n x(n) z^{-n}$
- $x(n) = -(a)^n u(-n - 1)$

Örnek 4

- $X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$ ve YB: $|z| > 1$ ise $x(n) = ?$

Örnek 4

- $X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$ ve YB: $|z| > 1$ ise $x(n) = ?$

1	$1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}$
$1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}$	
$\frac{3}{2}z^{-1} - \frac{1}{2}z^{-2}$	$1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots$
$\frac{3}{2}z^{-1} - \frac{9}{4}z^{-2} + \frac{3}{4}z^{-3}$	
$\frac{7}{4}z^{-2} - \frac{3}{4}z^{-3}$	
$\frac{7}{4}z^{-2} - \frac{21}{8}z^{-3} + \frac{7}{8}z^{-4}$	
$\frac{15}{8}z^{-3} - \frac{7}{8}z^{-4}$	
\vdots	

Örnek 4

- $X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$ ve YB: $|z| > 1$ ise $x(n) = ?$

$$\begin{array}{r|l}
 1 & 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} \\
 \hline
 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} & 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} \\
 \hline
 \frac{3}{2}z^{-1} - \frac{1}{2}z^{-2} & 1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots \\
 \hline
 \frac{3}{2}z^{-1} - \frac{9}{4}z^{-2} + \frac{3}{4}z^{-3} & \\
 \hline
 \frac{7}{4}z^{-2} - \frac{3}{4}z^{-3} & \\
 \hline
 \frac{7}{4}z^{-2} - \frac{21}{8}z^{-3} + \frac{7}{8}z^{-4} & \\
 \hline
 \frac{15}{8}z^{-3} - \frac{7}{8}z^{-4} & \\
 \vdots &
 \end{array}$$

- $X(z) = 1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots$

Örnek 4

- $X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$ ve YB: $|z| > 1$ ise $x(n) = ?$

$$\begin{array}{r|l}
 1 & 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} \\
 \hline
 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} & 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} \\
 \hline
 \frac{3}{2}z^{-1} - \frac{1}{2}z^{-2} & 1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots \\
 \hline
 \frac{3}{2}z^{-1} - \frac{9}{4}z^{-2} + \frac{3}{4}z^{-3} & \\
 \hline
 \frac{7}{4}z^{-2} - \frac{3}{4}z^{-3} & \\
 \hline
 \frac{7}{4}z^{-2} - \frac{21}{8}z^{-3} + \frac{7}{8}z^{-4} & \\
 \hline
 \frac{15}{8}z^{-3} - \frac{7}{8}z^{-4} & \\
 \vdots &
 \end{array}$$

- $X(z) = 1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots$

- $X(z) = \sum_{n=0}^{\infty} \boxed{} z^{-n}$

Örnek 4

- $X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$ ve YB: $|z| > 1$ ise $x(n) = ?$

$$\begin{array}{r|l}
 1 & 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} \\
 \hline
 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} & 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} \\
 \hline
 \frac{3}{2}z^{-1} - \frac{1}{2}z^{-2} & 1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots \\
 \hline
 \frac{3}{2}z^{-1} - \frac{9}{4}z^{-2} + \frac{3}{4}z^{-3} & \\
 \hline
 \frac{7}{4}z^{-2} - \frac{3}{4}z^{-3} & \\
 \hline
 \frac{7}{4}z^{-2} - \frac{21}{8}z^{-3} + \frac{7}{8}z^{-4} & \\
 \hline
 \frac{15}{8}z^{-3} - \frac{7}{8}z^{-4} & \\
 \vdots &
 \end{array}$$

- $X(z) = 1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots$

- $X(z) = \sum_{n=0}^{\infty} \frac{2^{n+1}-1}{2^n} z^{-n}$

Örnek 4

- $X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$ ve YB: $|z| > 1$ ise $x(n) = ?$

$$\begin{array}{r|l}
 1 & 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} \\
 \hline
 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} & 1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2} \\
 \hline
 \frac{3}{2}z^{-1} - \frac{1}{2}z^{-2} & 1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots \\
 \hline
 \frac{3}{2}z^{-1} - \frac{9}{4}z^{-2} + \frac{3}{4}z^{-3} & \\
 \hline
 \frac{7}{4}z^{-2} - \frac{3}{4}z^{-3} & \\
 \hline
 \frac{7}{4}z^{-2} - \frac{21}{8}z^{-3} + \frac{7}{8}z^{-4} & \\
 \hline
 \frac{15}{8}z^{-3} - \frac{7}{8}z^{-4} & \\
 \vdots &
 \end{array}$$

- $X(z) = 1 + \frac{3}{2}z^{-1} + \frac{7}{4}z^{-2} + \frac{15}{8}z^{-3} + \dots$

- $X(z) = \sum_{n=0}^{\infty} \frac{2^{n+1}-1}{2^n} z^{-n}$

- $x(n) = \left(2 - \left(\frac{1}{2}\right)^n\right) u(n)$

Örnek 5

- $X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$ ve YB: $|z| < \frac{1}{2}$ ise $x(n) = ?$
- $x(n) = \left(\left(\frac{1}{2} \right)^n - 2 \right) u(-n - 2)$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$

Kısmi Kesirlere Ayırma

- $X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$
- $X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \frac{A_j}{(1-a_jz^{-1})}$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$
- $$X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \frac{A_j}{(1-a_jz^{-1})}$$
- $$A_j = (1 - a_jz^{-1})X(z)\Big|_{z=a_j}$$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$
- $$X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$$
- $$A_j = (1 - a_jz^{-1})X(z)\Big|_{z=a_j}$$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$
- $$X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$$
- $$A_j = (1 - a_jz^{-1})X(z)\Big|_{z=a_j}$$
- $$X_j(z) \rightarrow \text{YB: } |z| > |a_j| \text{ ya da } |z| < |a_j|$$

Kısmi Kesirlere Ayırma

- $X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$
- $X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$
- $A_j = (1 - a_jz^{-1})X(z)\big|_{z=a_j}$
- $X_j(z) \rightarrow YB_j: |z| > |a_j|$ ya da $|z| < |a_j|$
- YB'ler belirlenir
 - ♦ $YB_1 \cap YB_2 \cap \cdots \cap YB_j$

Kısmi Kesirlere Ayırma

- $X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$
- $X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$
- $A_j = (1 - a_jz^{-1})X(z)\big|_{z=a_j}$
- $X_j(z) \rightarrow \text{YB}_j: |z| > |a_j|$ ya da $|z| < |a_j|$
- YB'ler belirlenir
 - ♦ $\text{YB}_1 \cap \text{YB}_2 \cap \cdots \cap \text{YB}_j \equiv \text{Verilen YB olmalıdır.}$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$
- $$X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$$
- $$A_j = (1 - a_jz^{-1})X(z)\big|_{z=a_j}$$
- $X_j(z) \rightarrow \text{YB}_j: |z| > |a_j| \text{ ya da } |z| < |a_j|$
- YB'leri belirlenir
 - ♦ $\text{YB}_1 \cap \text{YB}_2 \cap \cdots \cap \text{YB}_j \equiv \text{Verilen YB olmalıdır.}$
- $$x_j(n) = \begin{cases} A_j(a_j)^n u(n), & |z| > |a_j| \end{cases}$$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$
- $$X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$$
- $$A_j = (1 - a_jz^{-1})X(z)\big|_{z=a_j}$$
- $X_j(z) \rightarrow \text{YB}_j: |z| > |a_j| \text{ ya da } |z| < |a_j|$
- YB'leri belirlenir
 - ♦ $\text{YB}_1 \cap \text{YB}_2 \cap \cdots \cap \text{YB}_j \equiv \text{Verilen YB olmalıdır.}$
- $$x_j(n) = \begin{cases} A_j(a_j)^n u(n), & |z| > |a_j| \\ -A_j(a_j)^n u(-n-1), & |z| < |a_j| \end{cases}$$

Kısmi Kesirlere Ayırma

- $X(z) = \frac{A(z)}{(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$
- $X(z) = \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$
- $A_j = (1 - a_jz^{-1})X(z)|_{z=a_j}$
- $X_j(z) \rightarrow YB_j: |z| > |a_j|$ ya da $|z| < |a_j|$
- YB'leri belirlenir
 - ♦ $YB_1 \cap YB_2 \cap \cdots \cap YB_j \equiv \text{Verilen YB olmalıdır.}$
- $x_j(n) = \begin{cases} A_j(a_j)^n u(n), & |z| > |a_j| \\ -A_j(a_j)^n u(-n-1), & |z| < |a_j| \end{cases}$
- $x(n) = \sum_j x_j(n)$

Kısmi Kesirlere Ayırma

- $X(z) = \frac{A(z)}{(1-bz^{-1})^r(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$
- $X(z) =$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-bz^{-1})^r(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$
- $$X(z) = \frac{B_0}{(1-bz^{-1})^r} + \frac{B_1}{(1-bz^{-1})^{r-1}} + \cdots + \frac{B_{r-1}}{(1-bz^{-1})} + \frac{A_1}{(1-a_1z^{-1})} +$$
$$\frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-bz^{-1})^r(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$
- $$X(z) = \frac{B_0}{(1-bz^{-1})^r} + \frac{B_1}{(1-bz^{-1})^{r-1}} + \cdots + \frac{B_{r-1}}{(1-bz^{-1})} + \frac{A_1}{(1-a_1z^{-1})} +$$
$$\frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$$
- $$B_0 = (1-bz^{-1})^r X(z)|_{z=b}$$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-bz^{-1})^r(1-a_1z^{-1})(1-a_2z^{-1})\cdots(1-a_jz^{-1})}$$
- $$X(z) = \frac{B_0}{(1-bz^{-1})^r} + \frac{B_1}{(1-bz^{-1})^{r-1}} + \cdots + \frac{B_{r-1}}{(1-bz^{-1})} + \frac{A_1}{(1-a_1z^{-1})} +$$
$$\frac{A_2}{(1-a_2z^{-1})} + \cdots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$$
- $$B_0 = (1 - bz^{-1})^r X(z)|_{z=b}$$
- $$B_1 = \left. \frac{\partial(B_0(z))}{\partial z} \right|_{z=b}$$

Kısmi Kesirlere Ayırma

- $$X(z) = \frac{A(z)}{(1-bz^{-1})^r(1-a_1z^{-1})(1-a_2z^{-1})\dots(1-a_jz^{-1})}$$
- $$X(z) = \frac{B_0}{(1-bz^{-1})^r} + \frac{B_1}{(1-bz^{-1})^{r-1}} + \dots + \frac{B_{r-1}}{(1-bz^{-1})} + \frac{A_1}{(1-a_1z^{-1})} + \frac{A_2}{(1-a_2z^{-1})} + \dots + \underbrace{\frac{A_j}{(1-a_jz^{-1})}}_{X_j(z)}$$
- $$B_0 = (1 - bz^{-1})^r X(z)|_{z=b}$$
- $$B_1 = \left. \frac{\partial(B_0(z))}{\partial z} \right|_{z=b}$$
- $$B_k = \left. \frac{1}{k} \frac{\partial(B_{k-1}(z))}{\partial z} \right|_{z=b}$$

Kısmi Kesirlere Ayırma

- $X(z) = \frac{A(z)}{B(z)}$
- En Küçük Dereceli Terim: EKDT
- $A(z)_{EKDT} > B(z)_{EKDT}$ olmalıdır.

Kısmi Kesirlere Ayırma

- $X(z) = \frac{A(z)}{B(z)}$
- En Küçük Dereceli Terim: EKDT
- $A(z)_{EKDT} > B(z)_{EKDT}$ olmalıdır.
- $A(z)_{EKDT} \leq B(z)_{EKDT}$ ise fonksiyon bölmesi yapılmalıdır.
 - ♦ Bölme: YB' den bağımsız EKDT' den başlanmalı
 - Kuvvet Seri Açılımından farklı
 - ♦ Bölme $D(z)_{EKDT} > B(z)_{EKDT}$ olana kadar devam eder.

$$\begin{array}{r|l} A(z) & B(z) \\ \hline & C(z) \\ \hline D(z) & \end{array}$$

Kısmi Kesirlere Ayırma

- $X(z) = \frac{A(z)}{B(z)} = C(z) + \frac{D(z)}{B(z)}$
- En Küçük Dereceli Terim: EKDT
- $A(z)_{EKDT} > B(z)_{EKDT}$ olmalıdır.
- $A(z)_{EKDT} \leq B(z)_{EKDT}$ ise fonksiyon bölmesi yapılmalıdır.
 - ♦ Bölme: YB' den bağımsız EKDT' den başlanmalı
 - Kuvvet Seri Açılımından farklı
 - ♦ Bölme $D(z)_{EKDT} > B(z)_{EKDT}$ olana kadar devam eder.
 - ♦ Kalan kısmında elde edilen fonksiyon, $\frac{D(z)}{B(z)}$ kısmi kesirlere ayrılır.
 - Ters dönüşüm YB' ye göre yapılır.

$$\begin{array}{r|l} A(z) & B(z) \\ \hline & C(z) \\ \hline D(z) & \end{array}$$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

$$\begin{array}{r|l} z^{-1} & -\frac{1}{4}z^{-1} + 1 \\ z^{-1} - 4 & \\ \hline 4 & -4 \end{array}$$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

$$\begin{array}{r|l} z^{-1} & -\frac{1}{4}z^{-1} + 1 \\ z^{-1} - 4 & \\ \hline 4 & -4 \end{array}$$

- $X(z) =$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

$$\begin{array}{r|l} z^{-1} & -\frac{1}{4}z^{-1} + 1 \\ z^{-1} - 4 & \\ \hline 4 & -4 \end{array}$$

- $X(z) = -4 + \frac{4}{1 - \frac{1}{4}z^{-1}}$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

$$\begin{array}{r|l} z^{-1} & -\frac{1}{4}z^{-1} + 1 \\ z^{-1} - 4 & \\ \hline 4 & -4 \end{array}$$

- $X(z) = -4 + \underbrace{\frac{4}{1 - \frac{1}{4}z^{-1}}}_{X_1(z)}$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

$$\begin{array}{r|l} z^{-1} & -\frac{1}{4}z^{-1} + 1 \\ z^{-1} - 4 & \\ \hline 4 & -4 \end{array}$$

- $X(z) = -4 + \underbrace{\frac{4}{1 - \frac{1}{4}z^{-1}}}_{X_1(z)}$

- $X_1(z) = 4 \frac{1}{1 - \frac{1}{4}z^{-1}} \rightarrow x_1(n) =$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

$$\begin{array}{r|l} z^{-1} & -\frac{1}{4}z^{-1} + 1 \\ z^{-1} - 4 & \\ \hline 4 & -4 \end{array}$$

- $X(z) = -4 + \underbrace{\frac{4}{1 - \frac{1}{4}z^{-1}}}_{X_1(z)}$

- $X_1(z) = 4 \frac{1}{1 - \frac{1}{4}z^{-1}} \rightarrow x_1(n) = 4 \left(\frac{1}{4}\right)^n u(n) = \left(\frac{1}{4}\right)^{n-1} u(n)$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

$$\begin{array}{r|l} z^{-1} & -\frac{1}{4}z^{-1} + 1 \\ z^{-1} - 4 & \\ \hline 4 & -4 \end{array}$$

- $X(z) = -4 + \underbrace{\frac{4}{1 - \frac{1}{4}z^{-1}}}_{X_1(z)}$

- $X_1(z) = 4 \frac{1}{1 - \frac{1}{4}z^{-1}} \rightarrow x_1(n) = 4 \left(\frac{1}{4}\right)^n u(n) = \left(\frac{1}{4}\right)^{n-1} u(n)$

- $x(n) = \boxed{} + \left(\frac{1}{4}\right)^{n-1} u(n)$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$

$$\begin{array}{r|l} z^{-1} & -\frac{1}{4}z^{-1} + 1 \\ z^{-1} - 4 & \\ \hline 4 & -4 \end{array}$$

- $X(z) = -4 + \underbrace{\frac{4}{1 - \frac{1}{4}z^{-1}}}_{X_1(z)}$

- $X_1(z) = 4 \frac{1}{1 - \frac{1}{4}z^{-1}} \rightarrow x_1(n) = 4 \left(\frac{1}{4}\right)^n u(n) = \left(\frac{1}{4}\right)^{n-1} u(n)$

- $x(n) = -4\delta(n) + \left(\frac{1}{4}\right)^{n-1} u(n)$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$
- $X(z) = -4 + \underbrace{\frac{4}{1 - \frac{1}{4}z^{-1}}}_{X_1(z)}$
- $X_1(z) = 4 \frac{1}{1 - \frac{1}{4}z^{-1}} \rightarrow x_1(n) = 4 \left(\frac{1}{4}\right)^n u(n) = \left(\frac{1}{4}\right)^{n-1} u(n)$
- $x(n) = -4\delta(n) + \left(\frac{1}{4}\right)^{n-1} u(n)$
- $|z| < \frac{1}{4}$ ise $x(n) =$

Örnek 5

- $X(z) = \frac{z^{-1}}{1 - \frac{1}{4}z^{-1}}$ ve YB: $|z| > \frac{1}{4}$ ise $x(n) = ?$
- $X(z) = -4 + \underbrace{\frac{4}{1 - \frac{1}{4}z^{-1}}}_{X_1(z)}$
- $X_1(z) = 4 \frac{1}{1 - \frac{1}{4}z^{-1}} \rightarrow x_1(n) = 4 \left(\frac{1}{4}\right)^n u(n) = \left(\frac{1}{4}\right)^{n-1} u(n)$
- $x(n) = -4\delta(n) + \left(\frac{1}{4}\right)^{n-1} u(n)$
- $|z| < \frac{1}{4}$ ise $x(n) = -4\delta(n) - \left(\frac{1}{4}\right)^{n-1} u(-n-1)$

Örnek 6

- $X(z) = \frac{4 - \frac{7}{4}z^{-1} + \frac{1}{4}z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$ ve YB: $|z| > \frac{1}{2}$ ise $x(n) = ?$

Örnek 6

- $X(z) = \frac{4 - \frac{7}{4}z^{-1} + \frac{1}{4}z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$ ve YB: $|z| > \frac{1}{2}$ ise $x(n) = ?$

$$\frac{1}{4}z^{-2} - \frac{7}{4}z^{-1} + 4 \quad \bigg| \quad \frac{1}{8}z^{-2} - \frac{3}{4}z^{-1} + 1$$

Örnek 6

- $X(z) = \frac{4 - \frac{7}{4}z^{-1} + \frac{1}{4}z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$ ve YB: $|z| > \frac{1}{2}$ ise $x(n) = ?$

$$\begin{array}{r|l} \frac{1}{4}z^{-2} - \frac{7}{4}z^{-1} + 4 & \frac{1}{8}z^{-2} - \frac{3}{4}z^{-1} + 1 \\ \frac{1}{4}z^{-2} - \frac{6}{4}z^{-1} + 2 & \\ \hline -\frac{1}{4}z^{-1} + 2 & 2 \end{array}$$

- $X(z) =$

Örnek 6

- $X(z) = \frac{4 - \frac{7}{4}z^{-1} + \frac{1}{4}z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$ ve YB: $|z| > \frac{1}{2}$ ise $x(n) = ?$

$$\begin{array}{l|l} \frac{1}{4}z^{-2} - \frac{7}{4}z^{-1} + 4 & \frac{1}{8}z^{-2} - \frac{3}{4}z^{-1} + 1 \\ \frac{1}{4}z^{-2} - \frac{6}{4}z^{-1} + 2 & \\ \hline -\frac{1}{4}z^{-1} + 2 & 2 \end{array}$$

- $X(z) = 2 + \frac{2 - \frac{1}{4}z^{-1}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$

Örnek 6

- $X(z) = \frac{4 - \frac{7}{4}z^{-1} + \frac{1}{4}z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$ ve YB: $|z| > \frac{1}{2}$ ise $x(n) = ?$

$$\begin{array}{r|l} \frac{1}{4}z^{-2} - \frac{7}{4}z^{-1} + 4 & \frac{1}{8}z^{-2} - \frac{3}{4}z^{-1} + 1 \\ \frac{1}{4}z^{-2} - \frac{6}{4}z^{-1} + 2 & \\ \hline -\frac{1}{4}z^{-1} + 2 & 2 \end{array}$$

- $X(z) = 2 + \frac{2 - \frac{1}{4}z^{-1}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}} = 2 + \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)}$

Örnek 6

- $X(z) = \frac{4 - \frac{7}{4}z^{-1} + \frac{1}{4}z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$ ve YB: $|z| > \frac{1}{2}$ ise $x(n) = ?$

$$\begin{array}{r|l} \frac{1}{4}z^{-2} - \frac{7}{4}z^{-1} + 4 & \frac{1}{8}z^{-2} - \frac{3}{4}z^{-1} + 1 \\ \frac{1}{4}z^{-2} - \frac{6}{4}z^{-1} + 2 & \\ \hline -\frac{1}{4}z^{-1} + 2 & 2 \end{array}$$

- $X(z) = 2 + \frac{2 - \frac{1}{4}z^{-1}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}} = 2 + \underbrace{\frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)}}_{X_1(z)}$

Örnek 6

- $X(z) = \frac{4 - \frac{7}{4}z^{-1} + \frac{1}{4}z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$ ve YB: $|z| > \frac{1}{2}$ ise $x(n) = ?$
- $X(z) = 2 + \frac{2 - \frac{1}{4}z^{-1}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}} = 2 + \frac{2 - \frac{1}{4}z^{-1}}{\underbrace{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)}_{X_1(z)}}$
- $X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} =$

Örnek 6

- $X(z) = \frac{4 - \frac{7}{4}z^{-1} + \frac{1}{4}z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$ ve YB: $|z| > \frac{1}{2}$ ise $x(n) = ?$
- $X(z) = 2 + \frac{2 - \frac{1}{4}z^{-1}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}} = 2 + \underbrace{\frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)}}_{X_1(z)}$
- $X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$

Örnek 6

- $X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$
- $A =$

Örnek 6

- $X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$
- $A = \left(1 - \frac{1}{2}z^{-1}\right) X_1(z) \Big|_{z^{-1}=2} =$

Örnek 6

- $$X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$$
- $$A = \left(1 - \frac{1}{2}z^{-1}\right) X_1(z) \Big|_{z^{-1}=2} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)} \Big|_{z^{-1}=2} =$$

Örnek 6

- $X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$
- $A = \left(1 - \frac{1}{2}z^{-1}\right) X_1(z) \Big|_{z^{-1}=2} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)} \Big|_{z^{-1}=2} = 3$
- $B =$

Örnek 6

- $$X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$$
- $$A = \left(1 - \frac{1}{2}z^{-1}\right) X_1(z) \Big|_{z^{-1}=2} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)} \Big|_{z^{-1}=2} = 3$$
- $$B = \left(1 - \frac{1}{4}z^{-1}\right) X_1(z) \Big|_{z^{-1}=4} =$$

Örnek 6

- $$X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$$
- $$A = \left(1 - \frac{1}{2}z^{-1}\right) X_1(z) \Big|_{z^{-1}=2} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)} \Big|_{z^{-1}=2} = 3$$
- $$B = \left(1 - \frac{1}{4}z^{-1}\right) X_1(z) \Big|_{z^{-1}=4} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)} \Big|_{z^{-1}=4} =$$

Örnek 6

- $$X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$$
- $$A = \left(1 - \frac{1}{2}z^{-1}\right) X_1(z) \Big|_{z^{-1}=2} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)} \Big|_{z^{-1}=2} = 3$$
- $$B = \left(1 - \frac{1}{4}z^{-1}\right) X_1(z) \Big|_{z^{-1}=4} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)} \Big|_{z^{-1}=4} = -1$$

Örnek 6

- $$X_1(z) = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)} = \frac{A}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{B}{\left(1 - \frac{1}{4}z^{-1}\right)}$$
- $$A = \left(1 - \frac{1}{2}z^{-1}\right) X_1(z) \Big|_{z^{-1}=2} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)} \Big|_{z^{-1}=2} = 3$$
- $$B = \left(1 - \frac{1}{4}z^{-1}\right) X_1(z) \Big|_{z^{-1}=4} = \frac{2 - \frac{1}{4}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)} \Big|_{z^{-1}=4} = -1$$
- $$X(z) = 2 + \frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}$$

Örnek 6

- $X(z) = 2 + \frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)} + \frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}, \text{ YB: } |z| > \frac{1}{2} \text{ idi.}$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}}, \text{ YB: } |z| > \frac{1}{2} \text{ idi.}$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}}, \text{ YB: } |z| > \frac{1}{2} \text{ idi.}$
- $\text{YB1} \cap \text{YB2} \equiv |z| > \frac{1}{2} \text{ olmalıdır.}$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{YB1} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{YB2}$, YB: $|z| > \frac{1}{2}$ idi.
- $YB1 \cap YB2 \equiv |z| > \frac{1}{2}$ olmalıdır.
- $YB1: \begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases}$ ve $YB2: \begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases}$ olabilir

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}}, \text{ YB: } |z| > \frac{1}{2} \text{ idi.}$
- $\text{YB1} \cap \text{YB2} \equiv |z| > \frac{1}{2}$ olmalıdır.
- $\text{YB1: } \begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases}$ ve $\text{YB2: } \begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases}$ olabilir

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}}, \text{ YB: } |z| > \frac{1}{2} \text{ idi.}$
- $\text{YB1} \cap \text{YB2} \equiv |z| > \frac{1}{2} \text{ olmalıdır.}$
- $\text{YB1: } \begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases} \text{ ve YB2: } \begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases} \text{ olabilir}$
- $x(n) =$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}}, \text{ YB: } |z| > \frac{1}{2} \text{ idi.}$
- $\text{YB1} \cap \text{YB2} \equiv |z| > \frac{1}{2} \text{ olmalıdır.}$
- $\text{YB1: } \begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases} \text{ ve YB2: } \begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases} \text{ olabilir}$
- $x(n) = 2\delta(n) + \dots$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}}, \text{ YB: } |z| > \frac{1}{2} \text{ idi.}$
- $\text{YB1} \cap \text{YB2} \equiv |z| > \frac{1}{2} \text{ olmalıdır.}$
- $\text{YB1: } \begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases} \text{ ve YB2: } \begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases} \text{ olabilir}$
- $x(n) = 2\delta(n) + 3\left(\frac{1}{2}\right)^n u(n) + \dots$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}}, \text{ YB: } |z| > \frac{1}{2} \text{ idi.}$
- $\text{YB1} \cap \text{YB2} \equiv |z| > \frac{1}{2} \text{ olmalıdır.}$
- $\text{YB1: } \begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases} \text{ ve YB2: } \begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases} \text{ olabilir}$
- $x(n) = 2\delta(n) + 3\left(\frac{1}{2}\right)^n u(n) - \left(\frac{1}{4}\right)^n u(n)$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}},$
- YB: $|z| < \frac{1}{4}$ olsaydı
- YB1: $\begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases}$ ve YB2: $\begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases}$ olabilir
- $x(n) =$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}},$
- YB: $|z| < \frac{1}{4}$ olsaydı
- YB1: $\begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases}$ ve YB2: $\begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases}$ olabilir
- $x(n) =$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}},$
- YB: $|z| < \frac{1}{4}$ olsaydı
- YB1: $\begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases}$ ve YB2: $\begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases}$ olabilir
- $x(n) = 2\delta(n)$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}},$
- YB: $|z| < \frac{1}{4}$ olsaydı
- YB1: $\begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases}$ ve YB2: $\begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases}$ olabilir
- $x(n) = 2\delta(n) - 3\left(\frac{1}{2}\right)^n u(-n - 1)$

Örnek 6

- $X(z) = 2 + \underbrace{\frac{3}{\left(1 - \frac{1}{2}z^{-1}\right)}}_{\text{YB1}} + \underbrace{\frac{-1}{\left(1 - \frac{1}{4}z^{-1}\right)}}_{\text{YB2}},$
- YB: $|z| < \frac{1}{4}$ olsaydı
- YB1: $\begin{cases} |z| > \frac{1}{2} \\ |z| < \frac{1}{2} \end{cases}$ ve YB2: $\begin{cases} |z| > \frac{1}{4} \\ |z| < \frac{1}{4} \end{cases}$ olabilir
- $x(n) = 2\delta(n) - 3\left(\frac{1}{2}\right)^n u(-n-1) + \left(\frac{1}{4}\right)^n u(-n-1)$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$
- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-1})(1+z^{-1})} =$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$
- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-1})(1+z^{-1})} = \frac{1}{(1-z^{-1})^2(1+z^{-1})}$
- $X(z) =$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$
- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-1})(1+z^{-1})} = \frac{1}{(1-z^{-1})^2(1+z^{-1})}$
- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$
- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-1})(1+z^{-1})} = \frac{1}{(1-z^{-1})^2(1+z^{-1})}$
- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1+z^{-1})X(z)|_{z^{-1}=-1} =$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$
- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-1})(1+z^{-1})} = \frac{1}{(1-z^{-1})^2(1+z^{-1})}$
- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1+z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} =$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$
- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-1})(1+z^{-1})} = \frac{1}{(1-z^{-1})^2(1+z^{-1})}$
- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1+z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} = \frac{1}{4}$
- $A = (1-z^{-1})^2 X(z)|_{z^{-1}=1} =$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$
- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-1})(1+z^{-1})} = \frac{1}{(1-z^{-1})^2(1+z^{-1})}$
- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1+z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} = \frac{1}{4}$
- $A = (1-z^{-1})^2 X(z)|_{z^{-1}=1} = \frac{1}{(1+z^{-1})} \Big|_{z^{-1}=1} =$

Örnek 7

- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-2})}$, YB: $|z| > 1$ ise $x(n) = ?$
- $X(z) = \frac{1}{(1-z^{-1})(1-z^{-1})(1+z^{-1})} = \frac{1}{(1-z^{-1})^2(1+z^{-1})}$
- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1+z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} = \frac{1}{4}$
- $A = (1-z^{-1})^2 X(z)|_{z^{-1}=1} = \frac{1}{(1+z^{-1})} \Big|_{z^{-1}=1} = \frac{1}{2}$

Örnek 7

- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1 + z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} = \frac{1}{4}$
- $A = (1 - z^{-1})^2 X(z)|_{z^{-1}=1} = \frac{1}{(1+z^{-1})} \Big|_{z^{-1}=1} = \frac{1}{2}$
- $B =$

Örnek 7

- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1 + z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} = \frac{1}{4}$
- $A = (1 - z^{-1})^2 X(z)|_{z^{-1}=1} = \frac{1}{(1+z^{-1})} \Big|_{z^{-1}=1} = \frac{1}{2}$
- $B = \frac{\partial A(z)}{\partial z} \Big|_{z^{-1}=1} =$

Örnek 7

- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1 + z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} = \frac{1}{4}$
- $A = (1 - z^{-1})^2 X(z)|_{z^{-1}=1} = \frac{1}{(1+z^{-1})} \Big|_{z^{-1}=1} = \frac{1}{2}$
- $B = \frac{\partial A(z)}{\partial z} \Big|_{z^{-1}=1} = \frac{z^{-2}}{(1+z^{-1})^2} \Big|_{z^{-1}=1} =$

Örnek 7

- $X(z) = \frac{A}{(1-z^{-1})^2} + \frac{B}{(1-z^{-1})} + \frac{C}{(1+z^{-1})}$
- $C = (1 + z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} = \frac{1}{4}$
- $A = (1 - z^{-1})^2 X(z)|_{z^{-1}=1} = \frac{1}{(1+z^{-1})} \Big|_{z^{-1}=1} = \frac{1}{2}$
- $B = \frac{\partial A(z)}{\partial z} \Big|_{z^{-1}=1} = \frac{z^{-2}}{(1+z^{-1})^2} \Big|_{z^{-1}=1} = \frac{1}{4}$

Örnek 7

- $X(z) = \frac{1/2}{(1-z^{-1})^2} + \frac{1/4}{(1-z^{-1})} + \frac{1/4}{(1+z^{-1})}$
- $C = (1 + z^{-1})X(z)|_{z^{-1}=-1} = \frac{1}{(1-z^{-1})^2} \Big|_{z^{-1}=-1} = \frac{1}{4}$
- $A = (1 - z^{-1})^2 X(z)|_{z^{-1}=1} = \frac{1}{(1+z^{-1})} \Big|_{z^{-1}=1} = \frac{1}{2}$
- $B = \frac{\partial A(z)}{\partial z} \Big|_{z^{-1}=1} = \frac{z^{-2}}{(1+z^{-1})^2} \Big|_{z^{-1}=1} = \frac{1}{4}$

Örnek 7

- $$X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $x_1(n) = (-1)^n u(n)$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $x_1(n) = (-1)^n u(n)$
- $x_2(n) = (1)^n u(n)$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $x_1(n) = (-1)^n u(n)$
- $x_2(n) = (1)^n u(n)$
- $X_3(z)$ ' yi $X_2(z)$ ile nasıl elde ederiz.

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $X_3(z)$ ' yi $X_2(z)$ ile nasıl elde ederiz.
- $\frac{\partial}{\partial z} \left(\frac{1}{1-z^{-1}} \right) = \frac{-z^{-2}}{(1-z^{-1})^2}$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $X_3(z)$ ' yi $X_2(z)$ ile nasıl elde ederiz.
- $\frac{\partial}{\partial z} \left(\frac{1}{1-z^{-1}} \right) = \frac{-z^{-2}}{(1-z^{-1})^2}$
- $-z \frac{\partial}{\partial z} \left(\frac{1}{1-z^{-1}} \right) = \frac{z^{-1}}{(1-z^{-1})^2} \neq \frac{1}{(1-z^{-1})^2}$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $X_3(z)$ ' yi $X_2(z)$ ile nasıl elde ederiz.
- $\frac{\partial}{\partial z} \left(\frac{1}{1-z^{-1}} \right) = \frac{-z^{-2}}{(1-z^{-1})^2}$
- $-z \frac{\partial}{\partial z} \left(\frac{1}{1-z^{-1}} \right) = \frac{z^{-1}}{(1-z^{-1})^2} \neq \frac{1}{(1-z^{-1})^2}$
- $z \left[-z \frac{\partial}{\partial z} \left(\frac{1}{1-z^{-1}} \right) \right] = z \frac{z^{-1}}{(1-z^{-1})^2} = \frac{1}{(1-z^{-1})^2}$

Örnek 7

- $$X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$$
- $$z \left[-z \frac{\partial}{\partial z} \underbrace{\left(\frac{1}{1-z^{-1}} \right)}_{?} \right] = z \frac{z^{-1}}{(1-z^{-1})^2} = \frac{1}{(1-z^{-1})^2}$$

Örnek 7

$$\bullet X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$$

$$\bullet \underbrace{z \left[-z \frac{\partial}{\partial z} \underbrace{\left(\frac{1}{1-z^{-1}} \right)}_{u(n)} \right]}_{?} = z \frac{z^{-1}}{(1-z^{-1})^2} = \frac{1}{(1-z^{-1})^2}$$

Örnek 7

$$\bullet X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$$

$$\bullet \underbrace{z \left[\underbrace{-z \frac{\partial}{\partial z} \left(\underbrace{\frac{1}{1-z^{-1}}}_{u(n)}} \right)}_{nu(n)} \right]}_{?} = z \frac{z^{-1}}{(1-z^{-1})^2} = \frac{1}{(1-z^{-1})^2}$$

Örnek 7

$$\bullet X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$$

$$\bullet \underbrace{z \left[\underbrace{-z \frac{\partial}{\partial z} \left(\underbrace{\frac{1}{1-z^{-1}}}_{u(n)}} \right)}_{nu(n)} \right]}_{(n+1)u(n+1)} = z \frac{z^{-1}}{(1-z^{-1})^2} = \frac{1}{(1-z^{-1})^2}$$

Örnek 7

$$\bullet X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$$

$$\bullet \underbrace{z \left[-z \frac{\partial}{\partial z} \underbrace{\left(\frac{1}{1-z^{-1}} \right)}_{u(n)} \right]}_{\underbrace{nu(n)}_{(n+1)u(n+1)}} = z \frac{z^{-1}}{(1-z^{-1})^2} = \frac{1}{(1-z^{-1})^2}$$

$$\bullet (n+1)u(n+1) = \square, n = -1$$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $\underbrace{z \left[-z \frac{\partial}{\partial z} \left(\underbrace{\frac{1}{1-z^{-1}}}_{u(n)} \right) \right]}_{\underbrace{nu(n)}_{(n+1)u(n+1)}} = z \frac{z^{-1}}{(1-z^{-1})^2} = \frac{1}{(1-z^{-1})^2}$
- $(n+1)u(n+1) = 0, n = -1$
- $(n+1)u(n+1) = (n+1)u(n)$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $x_1(n) = (-1)^n u(n)$
- $x_2(n) = (1)^n u(n)$
- $x_3(n) = (n+1)u(n)$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $x_1(n) = (-1)^n u(n)$
- $x_2(n) = (1)^n u(n)$
- $x_3(n) = (n+1)u(n)$
- $x(n) = \frac{1}{4} (-1)^n u(n) + \frac{1}{4} u(n) + \frac{1}{2} (n+1)u(n)$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $x_1(n) = (-1)^n u(n)$
- $x_2(n) = (1)^n u(n)$
- $x_3(n) = (n+1)u(n)$
- $x(n) = \frac{1}{4}(-1)^n u(n) + \frac{1}{4}u(n) + \frac{1}{2}(n+1)u(n)$
- YB: $|z| < 1$ ise
 - ♦ $x(n) =$

Örnek 7

- $X(z) = \frac{1}{2} \underbrace{\frac{1}{(1-z^{-1})^2}}_{X_3(z)} + \frac{1}{4} \underbrace{\frac{1}{(1-z^{-1})}}_{X_2(z)} + \frac{1}{4} \underbrace{\frac{1}{(1+z^{-1})}}_{X_1(z)}, \text{ YB: } |z| > 1$
- $x_1(n) = (-1)^n u(n)$
- $x_2(n) = (1)^n u(n)$
- $x_3(n) = (n+1)u(n)$
- $x(n) = \frac{1}{4}(-1)^n u(n) + \frac{1}{4}u(n) + \frac{1}{2}(n+1)u(n)$
- YB: $|z| < 1$ ise
 - ♦ $x(n) = -\frac{1}{4}(-1)^n u(-n-1) - \frac{1}{4}u(-n-1) - \frac{1}{2}(n+1)u(-n-1)$