

Bilgisayar Mühendisliği
Yaz 2019 BSM307 İşaretler ve Sistemler
Dönem Sonu Sınavı

1. $X(z) = \frac{2 - \frac{5}{2}z^{-1} + z^{-2}}{(1 - \frac{1}{2}z^{-1})(1 - 2z^{-1})}$ ifadesinin ters z dönüşümünü $\frac{1}{2} < |z| < 2$ yakınsama bölgesi için bulunuz?

$$\frac{z^{-2} - \frac{5}{2}z^{-1} + 2}{z^{-2} - \frac{5}{2}z^{-1} + 1} = 1 + \frac{1}{z^{-2} - \frac{5}{2}z^{-1} + 1} \quad (5)$$

$$= 1 + \frac{A}{(1 - \frac{1}{2}z^{-1})} + \frac{B}{(1 - 2z^{-1})} \quad (5)$$

$$A = -\frac{1}{3} \quad (5)$$

$$B = \frac{4}{3} \quad (5)$$

$$x(n) = \delta(n) - \frac{1}{3} \cdot \left(\frac{1}{2}\right)^n u(n) - \frac{4}{3} \cdot 2^n u(-n-1) \quad (3) \quad (3) \quad (4)$$

2. $x(t) = \sin\left(\frac{t}{4}\right) + \cos(t) + \cos\left(\frac{t}{2}\right)$ işaretinin

- Temel frekansını bulunuz.
- Fourier seri katsayılarını bulunuz.
- Frekans spektrumunu çiziniz.

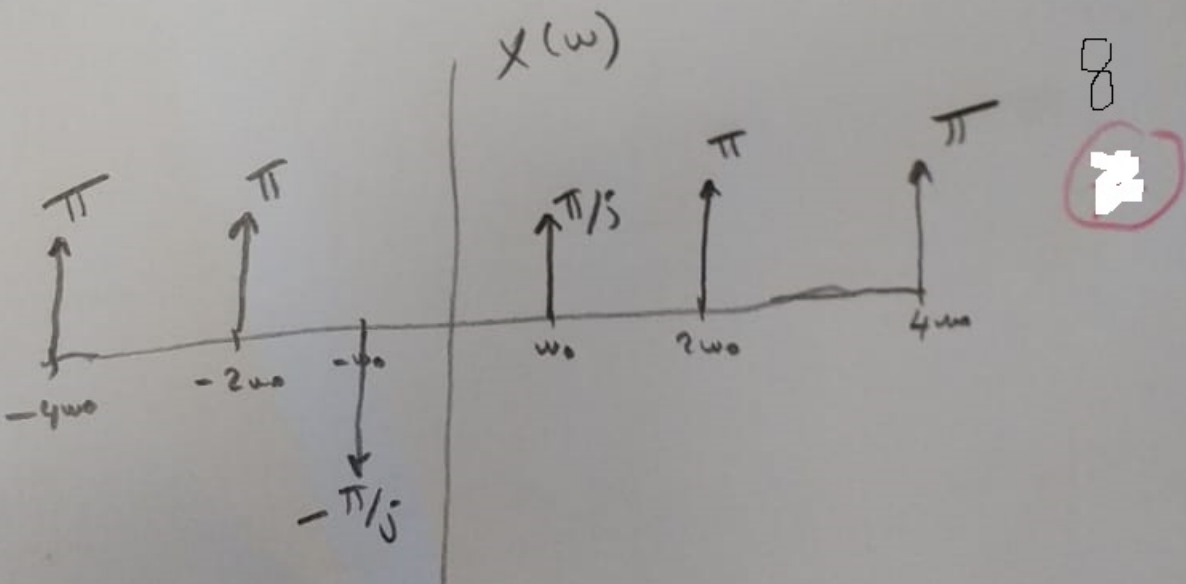
a) $\text{EBOB}\left(\frac{1}{4}, 1, \frac{1}{2}\right)$

$\omega_0 = \frac{1}{4}$ (5)

b) $x(t) = \frac{e^{j\omega_0 t} - e^{-j\omega_0 t}}{2j} + \frac{e^{j4\omega_0 t} + e^{-j4\omega_0 t}}{2} + \frac{e^{j2\omega_0 t} + e^{-j2\omega_0 t}}{2}$

$a_1 = \frac{1}{2j}$ (1) $a_2 = a_{-2} = \frac{1}{2}$ (1) $a_4 = a_{-4} = \frac{1}{2}$ (1)

$a_{-1} = -\frac{1}{2j}$ (1) (1) (1)



3

$$X(\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt \quad 5p$$

$$X(\omega) = \int_{-1}^{-1/2} -\frac{1}{2} e^{-j\omega t} dt + \int_{1/2}^1 \frac{1}{2} e^{-j\omega t} dt \quad 5p$$

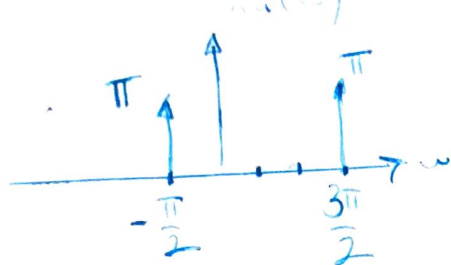
$$= +\frac{1}{2j\omega} e^{-j\omega t} \Big|_{-1}^{-1/2} + \frac{1}{2j\omega} e^{-j\omega t} \Big|_{1/2}^1 \quad 5p$$

$$= \frac{1}{2j\omega} (e^{j\frac{\omega}{2}} - e^{j\omega}) - \frac{1}{2j\omega} (e^{-j\omega} - e^{-j\frac{\omega}{2}})$$

$$= \frac{1}{2j\omega} (e^{j\frac{\omega}{2}} + e^{-j\frac{\omega}{2}}) - \frac{1}{2j\omega} (e^{j\omega} + e^{-j\omega}) \quad 5p$$

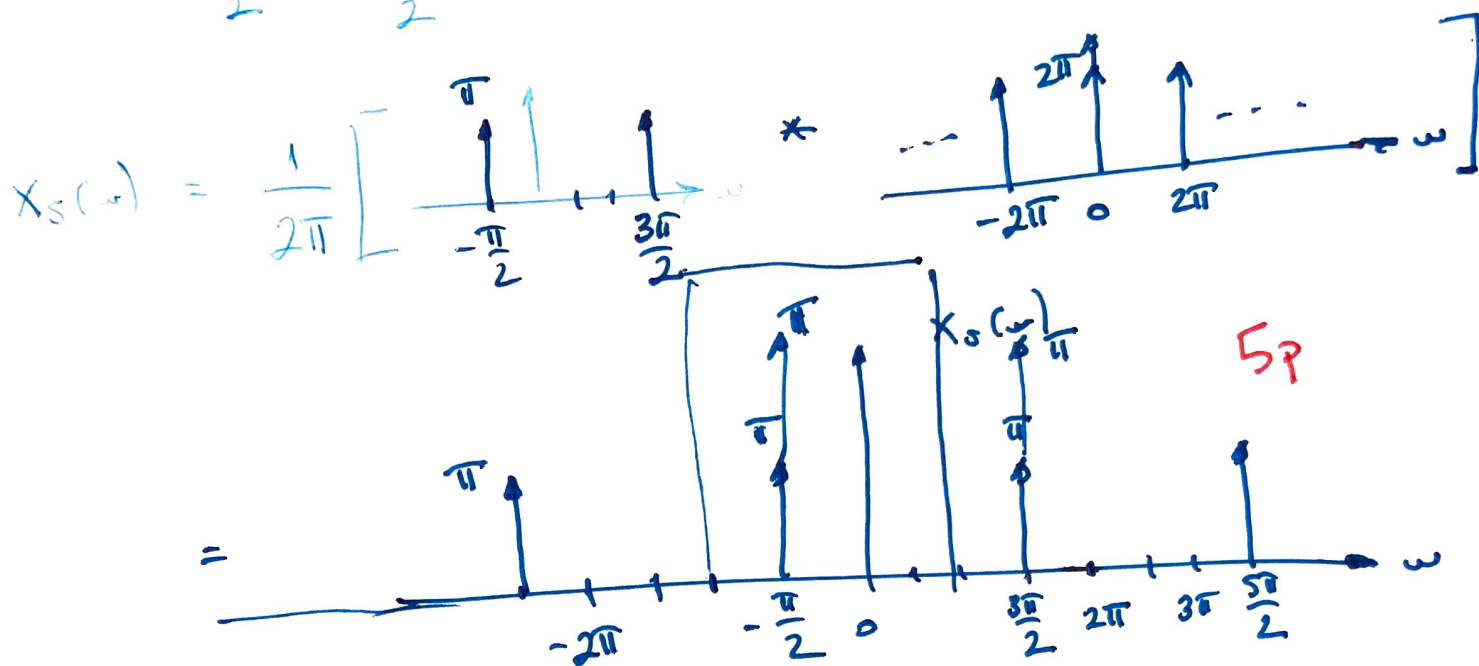
$$= \frac{1}{j\omega} \cos\left(\frac{\omega}{2}\right) - \frac{1}{j\omega} \cos(\omega) \quad 5p$$

④

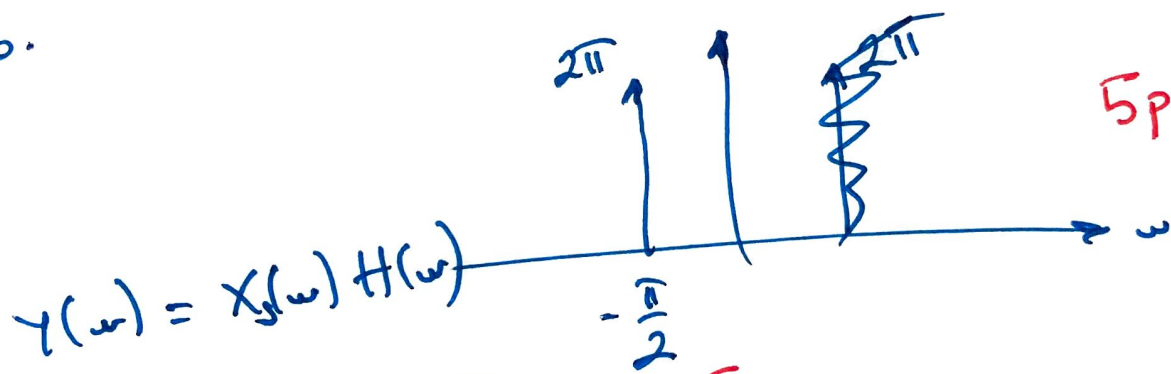


5p

$$\omega_s = \frac{2\pi}{T_s} = 2\pi \text{ rad./sn.}$$



b.



$$y(t) = e^{-j\frac{\pi}{2}t}$$

5p

c. $x(\omega) = x_a(nT_s) = x_a(n)$

$$= \frac{1}{2} \left(e^{-j\frac{\pi}{2}n} + e^{j\frac{3\pi}{2}n} \right)$$

5p