An Najah University – Faculty of engineering
Electrical Eng. Department
System and Signals

Instructor: Jamal Khrousheh

2nd hr exam
20/11/2008

13/20

Question #1(12 marks)

a) 1- Find Z-inverse for $X(z)=\dfrac{1+2z^{-1}+z^{-2}}{1-3z^{-1}+2z^{-2}}$

$X(0) = \lim_{z\to\infty} X(z)$

$X(\infty) = \lim_{z\to 1} (1-z^{-1})\, X(z)$

خلف الورقة

2- Find Z- transform for x(n) = μ(n) – μ(n-6)

خلف الورقة

3- Find x(0) and X(∞) for function has the following

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

8/12

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

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

$$(z^{-1}+1)^2 = A(z^{-1}-1) + B(2z^{-1}-1)$$

when $z^{-1}=1$ when $z^{-1}=2$

$4 = B$ $2.25 = A(-0.5)$

$\boxed{B=4}$ $\boxed{A=-4.5}$

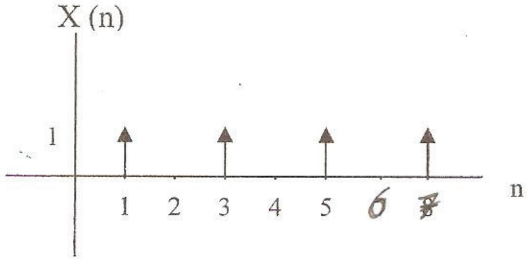
1.5/2

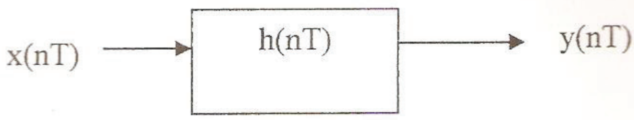
$$\frac{X(z)}{} = \frac{-4.5}{(2z^{-1}-1)} + \frac{4}{(z^{-1}-1)}$$

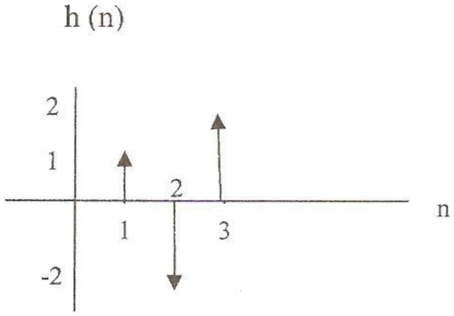
$$X(z) = \frac{4.5}{(1-2z^{-1})} - \frac{4}{(1-z^{-1})}$$

$$\boxed{X(n^{+}) = 4.5\,(2)^{n} - 4}$$

B- For system shown find y (n), knowing that x (n) and h (n)



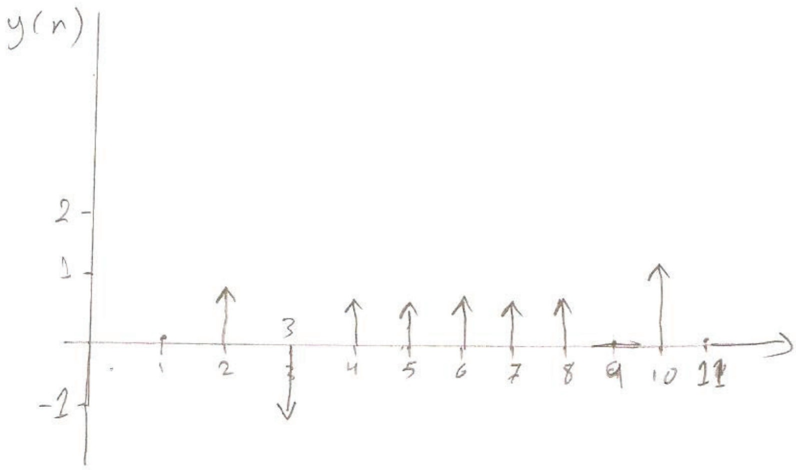




4/6

				0	1	0	1	0	1	0	1
2	-2	1	0								
0	2	-2	1	0							
0	0	2	-2	1	0						
0	0	0	2	-2	1	0					
0	0	0	0	2	-2	1	0				
0	0	0	0	0	2	-2	1	0			
0	0	0	0	0	0	2	-2	1	0		
							2	-2	1	0	
								2	-2	1	0
									2	-2	1
										2	-2

$y(0) = 0$
$y(1) = 0$
$y(2) = 1$
$y(3) = -1$
$y(4) = 1$
$y(5) = 1$
$y(6) = 1$
$y(7) = 1$
$y(8) = 1$
$y(9) = 0$
$y(10) = 2$
$y(11) = 0$



Question # 2 (8 marks)

- A certain filter has the following transfer function

$$H(j\omega)=\frac{0.01(j\omega+10^3)^2}{(j\omega)^2+2x10^2\,jw+10^4}$$

1- Sketch Bode diagrams?
2- What is the kind and cutoff frequency (frequencies) for the filter?
3- For $Vin(t)=2\cos(500t+30^0)+2\cos(1000t+30^o)$ what is Vo(t)

خلف الورقة

5/8

H(jw) can be written as

$$\frac{0.01\times\cancel{10^6}^{\,10^2}\left(\frac{jw}{10^3}+1\right)^2}{1\,\cancel{10^4}\left[\left(\frac{jw}{10^2}\right)^2+2\left(\frac{jw}{10^2}\right)+1\right]} \Rightarrow \frac{1\left(\frac{jw}{10^3}+1\right)^2}{\left(\frac{jw}{10^2}\right)^2+2\left(\frac{jw}{10^2}\right)+1} \Rightarrow \frac{\left(\frac{jw}{10^3}\right)^2+2\frac{jw}{10^3}}{\left(\frac{jw}{10^2}\right)^2+2\frac{jw}{10^2}}$$

* we can negli~~k~~kt the constant K = 1 because it's magnitued = 0

for $\left[\left(\frac{jw}{10^3}\right)^2+2\left(\frac{jw}{10^3}\right)+1\right]$

$\boxed{\omega_n=10^3}$

$$|\,|_{dB}=20\log\left(\frac{jw}{10^3}\right)^2=40\log\left(\frac{jw}{10^3}\right)=\begin{cases}w\gg10^3 & 40\log\frac{w}{10^3}\\ w\ll10^3 & 0\end{cases}$$

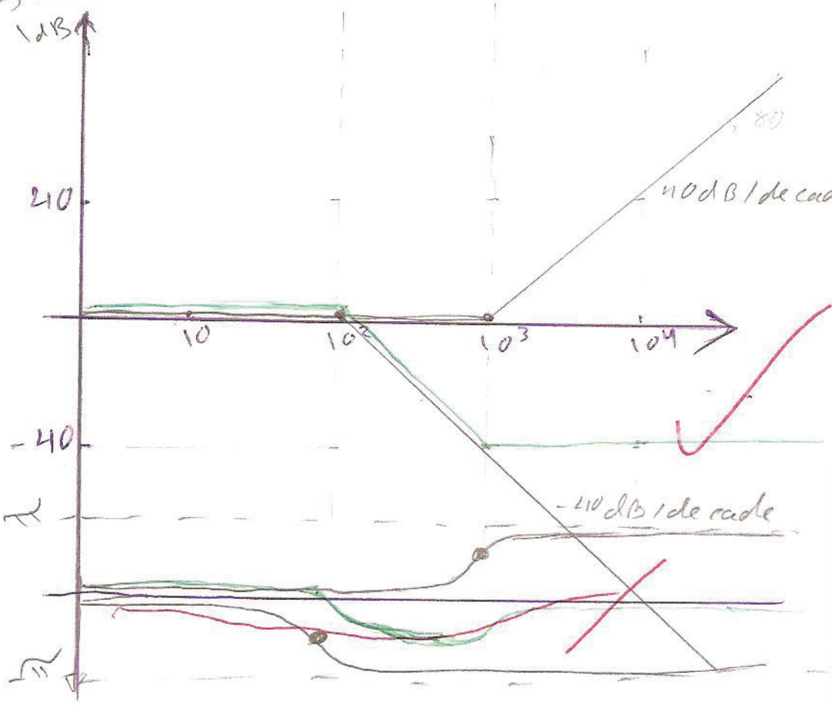
$\angle \Rightarrow$ will verius $0\to\pi$

for $\left[\left(\frac{jw}{10^2}\right)^2+2\left(\frac{jw}{10^2}\right)+1\right]$

$\omega_n=10^2$

$$|\,|_{dB}=-40\log\frac{jw}{10^2}\begin{cases}w\gg10^2 & -40\log\frac{w}{10^2}\\ w\ll10^2 & 0\end{cases}$$

$\angle \Rightarrow$ will verius $0\to-\pi$



-2

High ~~pass~~ filt

cuttof freq $=10^3$