
Quiz 2

Name:

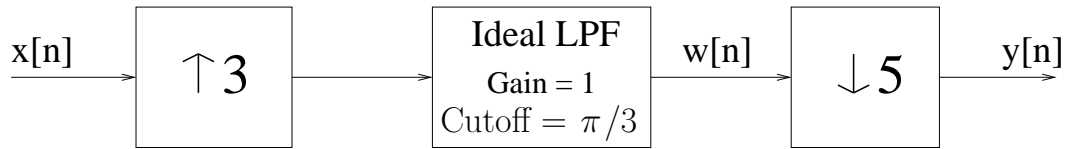
SID:

Instructions:

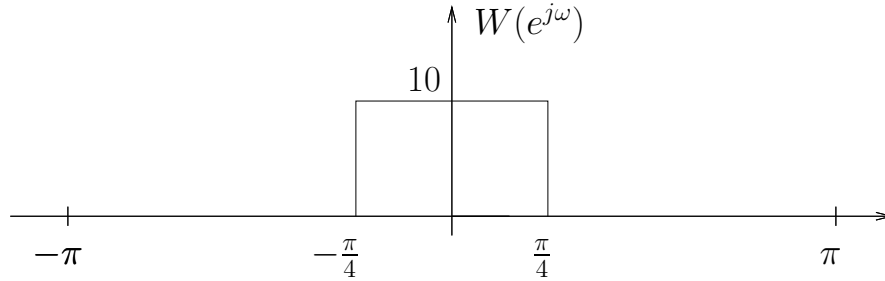
- **Make sure you write your name and SID.**
- The quiz is closed notes and closed book.
- Use of calculators or computers is prohibited.

Problem 1 (*Interpolation/Decimation.*) (10 pt)

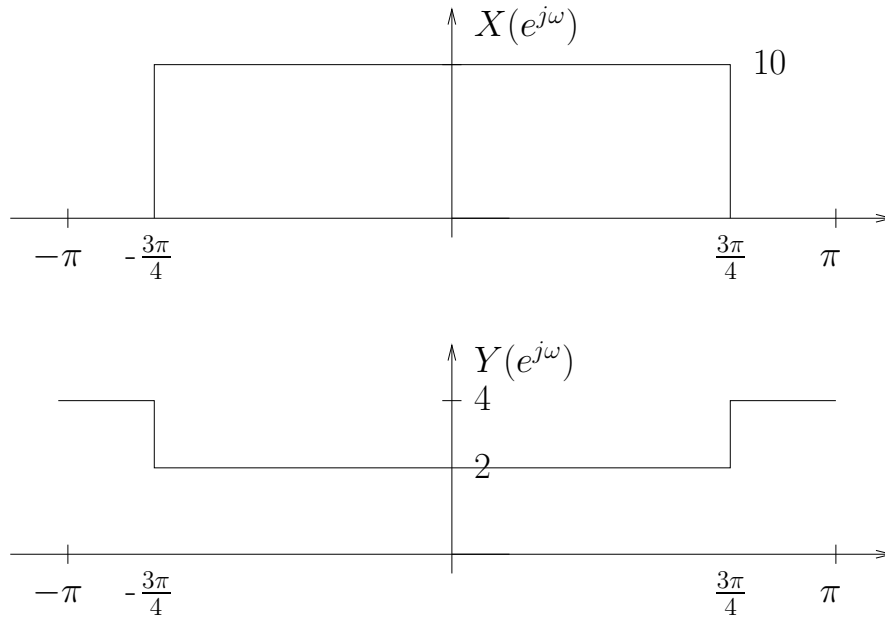
Consider the following multirate digital system.



The spectrum $W(e^{j\omega})$ of $w[n]$ is shown in the following figure.

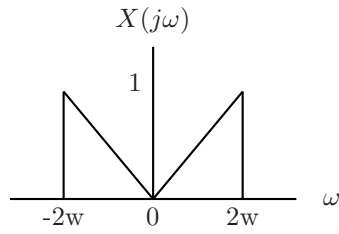
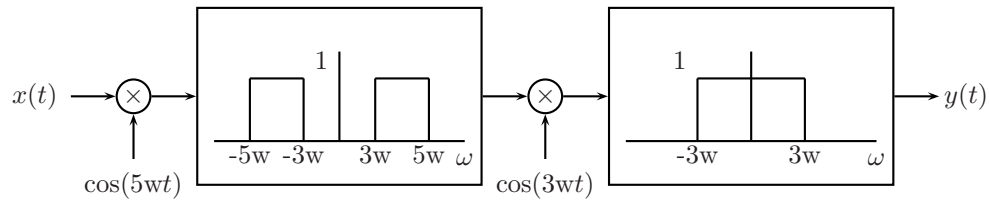


Sketch the spectra of $x[n]$ and $y[n]$. Be sure to clearly label all key points on both the horizontal and vertical axes.

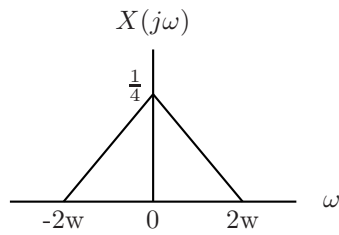


Problem 2 (*Communication system.*) (7 pt)

The following system has input signal $x(t)$ and output signal $y(t)$. The Fourier transform of $x(t)$ is shown below. Plot the Fourier transform of $y(t)$. Be sure to clearly label all key points on both the horizontal and vertical axes.



Answer:

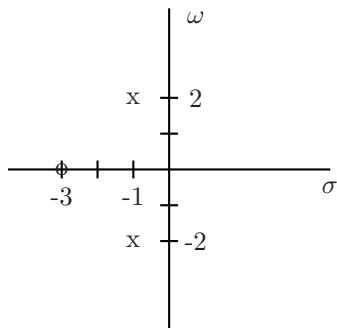


Problem 3 (*Laplace transform.*) (8 pt)

The Laplace transform of the impulse response $h(t)$ of a **causal** LTI system is

$$H(s) = \frac{s + 3}{(s + 1)^2 + 4}.$$

(a) (4 pt) Draw the pole-zero plot. Carefully label the plot.



(b) (2 pt) What is the ROC of $h(t)$?

$$\mathbf{Re\{s\} > -1}$$

(c) (2 pt) Is the system stable? Give a one-sentence explanation.

Yes, because the ROC contains the $j\omega$ -axis.