My Results *for* 50S17Quiz17

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Quiz still open - You cannot take this quiz again

- You can view your submission (all questions and your answers will be shown)
- Your incorrect answers are marked and feedback will be shown, if available
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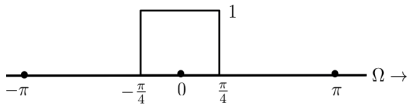
Submission (Saturday, June 3, 2017 at 8:30pm)

Key: (C) Correct/full credit (P) Partial credit (I) Incorrect/no credit Pending score Unscored/unreleased

1. Find the impulse resonse, h1[n], of the LTI system that has the frequency response H1(exp(j Omega))

   shown below.



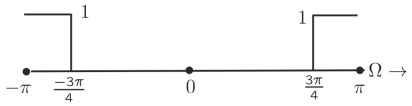
Apply the formula for the low pass filter from lecture.

- h1[n] = ((-1)^n) sinc(0.5 pi n)
- h1[n] = 0.5 sinc(0.5 pi n)
- (C) (•) h1[n] = 0.25 sinc(0.25 pi n)
- none of the above

2. Find the impulse resonse, h2[n], of the LTI system that has the frequency

H2(exp(jOmega)) as shown in the figure.

(h1[n] refers to the impulse response of the filter in Problem 1.)



Apply Ideal High Pass Filter formula from Lecture 17.

- (C) h2[n] = ((-1)^n)h1[n]
- h2[n] = h1[n-pi]
- h2[n] = cos(2pi) h1[n]
- none of the above

3. With h1[n] and h2[n] as specified in Problems 1 and 2,

   suppose we define

   h3[n] = delta[n] - h1[n] - h2[n]

   Evaluate the convolution

   h3[n] * (cos(pi n/8)+ cos(3pi n/8)+sin(5 pi n/8) + sin(9 pi n/16) + sin(5 pi n/2))

H3 is a bandpass filter which passes frequencies |Omega| between pi/4 and 3pi/4.
The input signal has frequencies
pi/8, 3pi/8, 5pi/8, 9pi/16, and 5pi/2
Note that the frequency 5pi/2 is the same as the frequency pi/2.

Except pi/8, all of these frequencies are in the pass band.
So the output consists of all the terms except the first one.

- cos(pi n/8)+ cos(3pi n/8)+sin(5 pi n/8) + sin(9 pi n/16)
- (C) cos(3pi n/8)+sin(5 pi n/8) + sin(9 pi n/16) + sin(5 pi n/2)
- cos(3pi n/8)+sin(5 pi n/8) + sin(9 pi n/16)
- none of the above

4.

The frequency response of the filter is H(exp(j Omega)) obtained by setting z=e^(j Omega).

Find the magnitude response |H(exp (j Omega))| for Omega = pi/2.

When Omega = pi/2, we have z = e^{j pi/2} = j

H(j) = (2j-1)/(2j+1)

|H(j)| = sqrt{5}/sqrt{5} = 1

- (C) 1
- 0
- 2cos(pi/2)+2
- none of the above

5.

Consider a filter described by the difference equation

y[n] = x[n] - x[n-1]

Find the magnitude response |H(exp(j Omega))| of this filter for

0 <= Omega <= pi

H(z) = 1- z^(-1)

H(e^(jW)) = 1 - e^(-jW)

=e^(-jW/2) (e^(jW/2) - e^(-jW/2))

=e^(-jW/2) 2j sin(W/2)

=e^(-jW/2) e^(j pi/2) 2 sin(W/2)

For W between 0 and pi, we have 2sin(W/2) is non-negative, so it is the magnitude response. The remaining phase term has phase (pi -W)/2

- (C) 2 sin(Omega/2)
- 2+2sin(Omega)
- 2+2sin(Omega/2)
- None of the above

What is the phase response of the filter of Problem 5, for Omega between 0 and pi.

See explanation for previous problem.

- Omega
- -Omega
- Omega/2
- -Omega/2
- (pi - Omega)/2
- (Omega - pi)/2
- None of the above

7. Is the Filter of Problem 5, a LOW pass filter?

2 sin(W/2) is 0 for W=0 and takes its max value (2) for W=pi. So it is a High Pass Filter.

- Yes
- No

8.

The transfer function of a filter has a pole at
z = 0.9
and there are no other poles or zeros. Choose the best description of the filter.

|H(Omega)| = 1/(distance of pole from e^{jOmega})

e^{j Omega} is a point on the unit circle.

Distance of 0.9 from e^{jOmega} is max when Omega=pi

Distance of 0.9 from e^{jOmega} is min when Omega = 0.

So |H(Omega)| = min when Omega is pi and max when Omega= 0.

C It is a non-ideal Low Pass Filter

It is a non-ideal High Pass Filter

It is a non-ideal Band Pass Filter

9.

The transfer function of a filter has a pole at
z = - 0.9
and a zero at
z = 1.
Choose the best description of the filter.

✓ |H(Omega)| = (distance from zero to e^jOmega) /(distance from pole to e^jOmega)}

is maximum when z = -1 (i.e., Omega = pi)
and min when z = 1 (i.e., Omega = 0)

So this is a (non-ideal) High Pass filter.

It is a non-ideal Low Pass Filter

C It is a non-ideal High Pass Filter

It is a non-ideal Band Pass Filter

10. Which of the following cannot be a valid DTFT?

✗ A DTFT must be periodic in Omega with period 2pi.
sin(Omega/2) has period 4 pi.

I H(exp(j Omega)) = sin(3Omega)

H(exp(j Omega)) = cos(Omega/2)sin(Omega/2)

H(exp(j Omega)) = sin^2(Omega/2)

H(exp(j Omega)) = sin(Omega/2)

Done

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