X

NPTEL

reviewer4@nptel.iitm.ac.in ▾

Courses » Mathematical Methods and Techniques in Signal Processing

Announcements **Course** Ask a Question Progress FAQ

Week 10 - Wavelets - II and Continuity of Functions

Register for Certification exam

Course outline

Assignment 10

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. **Due on 2019-04-10, 23:59 IST.**

Instructions:

1. **Attempt all questions.**
2. **Submission deadline**: 10th April 2019 23:59 IST
3. **Solutions to be posted**: 11th April 2019
4. Older browsers might show **unnecessary vertical bars** at the end of math equations

1) Consider the function $f(x) = 10 - 3x$ which is uniformly continuous. Considering ϵ and δ as defined in lecture 65, what is the minimum value of the ratio ϵ/δ?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 3

1 point

2) (True/False): If a function is Lipschitz continuous on interval A, then it is uniformly continuous on the interval A. ***1.5 points***

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

3) The function $f(x) = 7x^2 - 4x + 6$, where $x \in [-1, 1]$, is uniformly continuous. ***1.5 points***

4) Suppose we go up to the 7^{th} level dyadic/Haar wavelet decomposition of a 2D image, the number of subimages obtained in the decomposition are:

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 22

2 points

5) The Haar wavelets $\{\psi(2^i t - k) : k \in \mathbb{Z}\}$ contain spikes of $1/16^{\text{th}}$ unit of time. What is the value of i?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 3

2 points

2 points

6) (True/False): A signal can be represented in two ways, namely, in terms of its wavelet coefficients $b_k^{(i)}$'s and scaling coefficients $a_k^{(0)}$'s and in terms of only the scaling coefficient $a_k^{(i)}$'s. Given that the maximum resolution of the signal is 2^{-m} and the signal is of unit duration, the total number of wavelet coefficients $b_k^{(i)}$'s and scaling coefficients $a_k^{(0)}$'s is lesser than the total number of scaling coefficients $a_k^{(i)}$'s.

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

2 points

7) Consider a signal $s(t)$ as a rectangular pulse with amplitude A and duration T s, starting at $-T/2$. Treating time as a random variable, it is known that the mean in time μ_t using the induced norm of the signal as the distribution is 0. Which of the following criteria does the mean in frequency μ_ω and μ_t satisfy?

- $\mu_t < \mu_\omega$
- $\mu_t = \mu_\omega$
- $\mu_t > \mu_\omega$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\mu_t = \mu_\omega$

2.5 points

8) Consider the following Haar wavelet decomposition : $f(t) = -\frac{1}{4}\phi(t) - \frac{3}{4}\psi(t) + 3\psi(2t) - \frac{1}{2}\psi(2t-1)$. Let us suppose that we null out the subspace corresponding to the details at the highest resolution to get $g(t)$. Consider the following signals:

$$h_1(t) = \begin{cases} 1, & 0 \le t < 0.25, \\ -2, & 0.25 \le t < 0.5, \\ 0, & 0.5 \le t < 0.75, \\ -2, & 0.75 \le t < 1. \end{cases}; \quad h_2(t) = \begin{cases} 1, & 0 \le t < 0.25, \\ 2, & 0.25 \le t < 0.5, \\ -1, & 0.5 \le t < 0.75, \\ 0.75, & 0.75 \le t < 1. \end{cases};$$

$$h_3(t) = \begin{cases} 1, & 0 \le t < 0.5, \\ 0.75, & 0.5 \le t < 1. \end{cases}; \quad h_4(t) = \begin{cases} 2, & 0 \le t < 0.25, \\ -4, & 0.25 \le t < 0.5, \\ 0, & 0.5 \le t < 0.75, \\ 1, & 0.75 \le t < 1. \end{cases};$$

$$h_5(t) = \begin{cases} 2, & 0 \le t < 0.25, \\ 0, & 0.25 \le t < 0.5, \\ 1, & 0.5 \le t < 1. \end{cases}; \quad h_6(t) = \begin{cases} -1, & 0 \le t < 0.5, \\ 0.5, & 0.5 \le t < 1. \end{cases}.$$

Which of the following statements are true?

- The signal $f(t)$ is given by $h_1(t)$ and $g(t)$ is given by $h_3(t)$
- The signal $f(t)$ is given by $h_4(t)$ and $g(t)$ is given by $h_6(t)$
- The signal $f(t)$ is given by $h_4(t)$ and $g(t)$ is given by $h_5(t)$
- The signal $f(t)$ is given by $h_2(t)$ and $g(t)$ is given by $h_6(t)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
The signal $f(t)$ is given by $h_4(t)$ and $g(t)$ is given by $h_6(t)$

9) Consider a discrete signal $x[n]$ that is sampled at a rate F_s. Consider each sampling instant as a unit of time. Consider the length of the signal to be 32. If we represent the signal using wavelets, which of the following wavelets would have zero coefficients in the representation for any signal $x[n]$ of length 32? ***2.5 points***

- $\psi(0.5t - 12)$
- $\psi(t - 1)$
- $\psi(8t - 30)$
- $\psi(0.0625t - 1)$
- $\psi(0.125t - 6)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\psi(t - 1)$
$\psi(8t - 30)$
$\psi(0.125t - 6)$

10) A signal $p[n]$ is stored using its scaling coefficients $c_k^{(0)}$ and wavelet coefficients $d_k^{(i)}$ with respect to the normalized versions of the scaling function $\phi(t - k)$ and wavelets $\psi(2^i t - k)$ respectively. The coefficients for $p[n]$ are given as follows, ***3 points***

$c_0^{(0)} = 1, d_0^{(0)} = -1, d_0^{(1)} = \sqrt{2}, d_1^{(1)} = -\sqrt{2}, d_0^{(2)} = 0.5, d_1^{(2)} = 0.5, d_2^{(2)} = 0.5, d_3^{(2)} = 0.5$

Which of the following is the reconstructed signal in terms of $\phi(8t - k)$'s?

$[1.25\ 0.75\ -0.75\ -1.25\ 1.25\ 0.75\ 3.25\ 2.75]$

$\left[\frac{2\sqrt{2}+1}{2}\ \frac{2\sqrt{2}-1}{2}\ \frac{1-2\sqrt{2}}{2}\ \frac{-1-2\sqrt{2}}{2}\ \frac{5-2\sqrt{2}}{2}\ \frac{3-2\sqrt{2}}{2}\ \frac{5+2\sqrt{2}}{2}\ \frac{3+2\sqrt{2}}{2}\right]$

$[3\ 1\ -1\ -3\ 1\ -1\ 5\ 3]$

$[2\ 0\ -2\ -4\ 2\ 0\ 6\ 4]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[3\ 1\ -1\ -3\ 1\ -1\ 5\ 3]$

Previous Page End