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NPTEL

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Courses » Introduction to Time-Frequency Analysis and Wavelet Transforms

Announcements

Course

Ask a Question

Progress



Unit 8 - Week 3: Duration and Bandwidth

Course outline

Registration for
MATLAB Exam

How to access the
portal

MATLAB Online Access

MATLAB Tutorials
created by MathWorks

Week 1: Introduction,
Basic definitions and
Concepts

Week 2: Fourier
transforms (a review)

Week 3: Duration and
Bandwidth

- Lecture 4.1: Duration and Bandwidth
- Lecture 4.2: Bandwidth equation and Instantaneous frequency
- Lecture 4.3: Instantaneous frequency and analytic signals
- Lecture 4.4: Duration-Bandwidth Principle
- Lecture 4.5A: Requirements of time-frequency analysis techniques - Part 1
- Lecture 4.5B: Requirements of time-frequency analysis techniques - Part 2
- Data file: a3_sigData.mat
- Solutions to Week 3 Assignment
- Quiz : Week 3 Assignment

Week 4: Short-time
Fourier transform

Week 5: Wigner-Ville
Distributions

Week 6: Wigner-Ville
Distributions (Contd..)

Week 7: Continuous
Wavelet Transforms

Week 8: Continuous
Wavelet Transforms
(Contd..)

Week 9: Discrete
Wavelet Transforms

Week 3 Assignment

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2016-08-15, 23:59 IST

1)

1 point

1. Select the correct **statement(s)** with reference to the given signals:

$$x_1[k] = \begin{cases} \sin(0.2\pi k) & \forall k \in \{0, 1, \dots, 59\} \\ \sin(0.3\pi k) & \forall k \in \{60, 61, \dots, 119\} \end{cases}$$

$$x_2[k] = \begin{cases} \sin(0.3\pi k) & \forall k \in \{0, 1, \dots, 59\} \\ \sin(0.2\pi k) & \forall k \in \{60, 61, \dots, 119\} \end{cases}$$

- a. Both the signals are stationary.
- b. $x_1[k] + x_2[k]$ is a stationary signal.
- c. The spectra of both the signals are identical.
- d. The spectra of both the signals are completely different.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b
c

2)

1 point

2. Fourier transform is well suited to analyze

- a. Linear chirps
- b. Quadratic chirps
- c. Both linear and quadratic chirps
- d. None of the above

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

d

Week 10: Discrete Wavelet Transforms (Contd..)

Week 11: Discrete Wavelet Transforms (Contd..)

Week 12: DWT (Contd..) and Closing Summary

3)

1 point

3. Which of the following statements concerning the bandwidth of the signal

$$x(t) = \left(\frac{\alpha}{\pi}\right)^{\frac{1}{4}} e^{-\alpha(t-2)^2} e^{j\omega_0 t}$$

- It has non-zero contributions from both amplitude & frequency modulation.
- It has non-zero contribution only from amplitude modulation.
- It has equal contributions from both amplitude & frequency modulation.
- None of the above.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

4)

1 point

4. Given $0 \leq \omega_2 \leq \omega_1$, the analytic representation for the signal $x(t) = \sin(\omega_1 t) \sin(\omega_2 t)$

- $\cos(\omega_1 t) e^{j\omega_2 t}$
- $\cos(\omega_2 t) e^{j\omega_1 t}$
- $\sin(\omega_1 t) e^{j\omega_2 t}$
- $\sin(\omega_2 t) e^{j\omega_1 t}$

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

d

5)

1 point

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

c

6)

1 point

6. For a continuous-time signal $x(t)$ which is a Gaussian amplitude modulated sine wave with frequency ω_0 :

- The product of $\langle t \rangle$ and $\langle \omega \rangle$ is 0.
- The value of $\langle t \dot{\phi}(t) \rangle$ is 0.
- The value of $\langle t \dot{\phi}(t) \rangle$ is equal to $\langle t \rangle \langle \omega \rangle$.
- None of the above.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

7)

Questions **7** to **11** are based on the following signal (Answers for these questions have to be reported as an **integer**):

$$x(t) = \left(\frac{2}{\pi}\right)^{\frac{1}{4}} e^{-t^2 + jt^2 + jt}$$

7. Suppose the duration of the given signal is denoted by σ_t . The value of $6\sigma_t$ is

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 3

8)

8. Suppose the bandwidth of the given signal is denoted by σ_ω . The value of σ_ω^2 is

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 2

1 point

9)

9. The instantaneous frequency of the signal is $t + 1$ rad/sec.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 2

1 point

10)

10. The value of $\frac{B_{AM}}{B_{FM}}$ for the given signal is

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 1

1 point

11)

11. If covariance of the signal is denoted by $\sigma_{t\omega}$, the value of $10\sigma_{t\omega}$ is .

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 5

1 point

12)

Questions **12** to **15** requires usage of the Time-Frequency Toolbox (tftb) in MATLAB. A script is provided in the data file a3_sigData.mat. The time stamps of the signal are given by the vector (0:1:127).

(Round off the answers to these questions to **one decimal** place.)

12. The mean time for the given signal is

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 50.0

(Type: String) 50

1 point

13)

13. The center frequency for the given signal is _____ rad/sec.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 0.9



1 p

14)

14. The bandwidth (σ_ω) for the given signal is _____.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 0.1



1 point

15)

15. The minimum value of instantaneous frequency observed for the given signal is _____ rad/sec.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 0.3

1 point

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