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NPTEL

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Courses » Introduction to Time-Frequency Analysis and Wavelet Transforms

Announcements

Course

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## Unit 7 - Week 2: Fourier transforms (a review)

### 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)

- Lecture 3.1: Continuous time Fourier series
- Lecture 3.2: Continuous time Fourier transform
- Lecture 3.3: Discrete time Fourier series
- Lecture 3.4: Discrete time Fourier transform
- Lecture 3.5: Properties of Fourier transforms
- Lecture 3.6: Discrete Fourier transform
- Lecture: MATLAB demonstration-Periodogram
- Data file: a2\_sigData.mat
- Solutions to Week 2 Assignment
- Quiz : Week 2 Assignment

Week 3: Duration and Bandwidth

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 10: Discrete Wavelet Transforms (Contd..)

### Week 2 Assignment

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

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

1)

1 point

1. Select the correct statement from the following:

- a. Fourier transforms work with adaptive basis.
- b. Wavelet transforms work with fixed basis.
- c. Fourier transforms work with fixed basis while wavelet transforms work with adaptive basis.
- d. None of the above.

- a  
 b  
 c  
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

2)

1 point

2. Select the correct option(s) from the following.

- a. The analysis equation allows us to determine the atoms that make a signal.
- b. The synthesis equation describes how a signal is imagined to be constructed.
- c. The analysis equation allows us to imagine how a signal is constructed.
- d. The synthesis equation describes the atoms which take part in building a signal.

- a  
 b  
 c  
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a  
b

3)

1 point

3. Which of the following is TRUE regarding continuous time periodic signals?

- a. They have infinite power and finite energy.
- b. They have finite power and infinite energy.
- c. They have neither finite power nor finite energy.
- d. None of the above.

- a  
 b  
 c  
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

Week 11: Discrete  
Wavelet Transforms  
(Contd..)

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

b

4)

1 point

4. The Fourier series of a continuous time periodic signal  $x(t)$  is

$$x(t) = \sum c_n e^{j2\pi n F_0 t}$$

Which of the following is/are TRUE?

- a.  $c_n$  represents the power contribution of the  $n^{\text{th}}$  harmonic.
- b.  $|c_n|$  is a measure of extent of correlation between the signal and the  $n^{\text{th}}$  harmonic.
- c.  $|c_n|^2$  represents the power contribution of the  $n^{\text{th}}$  harmonic to signal power.
- d. None of the above

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b  
c

5)

1 point

5. Which of the following qualify/qualifies to be a fundamental frequency range for a discrete-time signal?

- a.  $\omega \in [-\pi, \pi]$ .
- b.  $\omega \in [-\frac{\pi}{8}, \frac{15\pi}{8}]$ .
- c.  $\omega \in [-\frac{\pi}{2}, \frac{3\pi}{2}]$ .
- d.  $\omega \in [-\frac{\pi}{4}, \frac{7\pi}{4}]$ .

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c  
d

6)

1 point

6. The input and output of an LTI system are related as  $x_2[k] = G(q^{-1})x_1[k]$ . Which of the following is/are TRUE with respect to energy spectral density?

- a.  $S_{x_2x_1}(f) = X_2(f)X_1^*(f)$
- b.  $S_{x_2x_1}(f) = G(e^{-j2\pi f})S_{x_1x_1}(f)$
- c.  $S_{x_2x_2}(f) = |G(e^{-j2\pi f})|^2 S_{x_1x_1}(f)$
- d. None of these

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a  
b  
c

7)

1 point

7. Which of the following statement(s) is/are TRUE?

- a. The power spectrum of the autocovariance  $P_{\sigma\sigma}[n]$  is the Fourier transform of the signal.
- b. The power spectrum of the signal  $P_{xx}[n]$  is the Fourier transform of the autocovariance.
- c. Both (a) and (b).
- d. Neither (a) nor (b).

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

8)

1 point

8. If  $x[k] \xrightarrow{\mathcal{F}} X(f)$ , then select the correct option(s):

- a.  $x\left[\frac{k-D}{\alpha}\right] \xrightarrow{\mathcal{F}} e^{-j\frac{2\pi f D}{\alpha}} X(\alpha f)$ .
- b.  $x\left[\frac{k}{\alpha} - D\right] \xrightarrow{\mathcal{F}} e^{-j2\pi f \alpha D} X(\alpha f)$ .
- c.  $e^{2\pi f_0 \alpha k} x[\alpha k] \xrightarrow{\mathcal{F}} X\left(\frac{f - \alpha f_0}{\alpha}\right)$
- d.  $e^{2\pi f_0 \alpha k} x\left[\frac{k}{\alpha}\right] \xrightarrow{\mathcal{F}} X\left(\frac{f + \alpha f_0}{\alpha}\right)$

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

c

9)

1 point

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

10)

For the questions 10 to 15 the answer has to be filled as a **numeric value** (report the value to the nearest integer).

10. The number of unique frequencies in a 512-point DFT is \_\_\_\_\_.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 257

1 point

11)

11. The average power of the signal  $x(t) = \sin(t) + \cos(t)$  is \_\_\_\_\_.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 1

1 point

12)

A signal is provided in the data file `a2_sigData.mat`. For the given signal answer the questions 12 to 15 using MATLAB.

12. The number of periodicities present in the given signal is \_\_\_\_\_.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 3



1 point

13)

13. If the frequency corresponding to the maximum power is  $f$  (cycles/sample). Then the value of  $10f$  is \_\_\_\_\_.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 1



1 point

14)

14. The value of total power of the signal in the frequency band  $[0, 0.5)$  cycles/sample is \_\_\_\_\_.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 61

1 point

15)

15. The absolute value of **third** element of  $N$ -point DFT vector is \_\_\_\_\_.  
(Note:  $N$  is the number of data points)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 1

1 point

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