Unit 13 - Week 8: Spectral Representations & Estimation Theory

Week 8 Assignment

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

Due on 2018-03-23, 23:59 IST

1) *1 point*

1. Given below is the spectral density function $\gamma_{vv}(\omega)$ of a stationary process $v[k]$

$$\gamma_{vv}(\omega) = \frac{1}{2\pi\,(1.81 + 1.8\cos 2\omega)}.$$

Which of the following is an appropriate representation for $v[k]$ with $\sigma_e^2 = 1$?

a. $v[k] = \dfrac{1}{1 + 0.9q^{-2}} e[k]$

b. $v[k] = \dfrac{1}{1 - 0.9q^{-2}} e[k]$

c. $v[k] = \dfrac{1}{1 + 0.9q^{-1}} e[k]$

d. $v[k] = \dfrac{1}{1 - 0.9q^{-1}} e[k]$

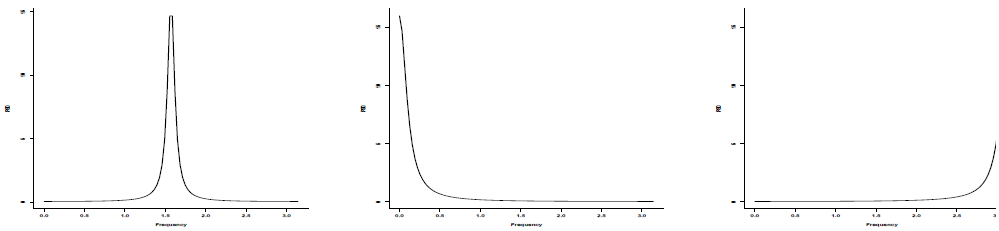
- a
- b
- c
- d

No, the answer is incorrect.
Score: 0

Accepted Answers:
a

2) *1 point*

2. Which of the following best represents the filtering characteristics of the process v Question 1?



(a) (b) (c)

- a
- b
- c

No, the answer is incorrect.
Score: 0

Accepted Answers:
a

3) *1 point*

3. For the spectral density function of a stationary process $v[k]$ given in Question 1 PACF of $v[k]$ at lag $l = 2$ is _____.

   a. 0

   b. -0.9

   c. 0.9

   d. None of the above

a
b
c
d

No, the answer is incorrect.
Score: 0

Accepted Answers:
b

4) *1 point*

4. Consider the fluid level measurement example given in class. Suppose we change c assumed model to

$$y[k] = c_1 + c_2 e[k], \quad e[k] \sim \mathcal{N}(0, \sigma_e^2)$$

choosing a least squares optimization function, which one of the following stateme are TRUE?

   a. c_1 can be estimated uniquely but c_2 cannot be

   b. c_2 can be estimated uniquely but c_1 cannot be

   c. Both c_1 and c_2 can be estimated uniquely

   d. Neither c_1 nor c_2 can be estimated uniquely

a
b
c
d

No, the answer is incorrect.
Score: 0

Accepted Answers:
a

5) *1 point*

5. Given a single observation y of an *exponential* white-noise process with p.d.f. $f(y) =$ the log-likelihood function $L(\theta = \lambda; y)$ is _____

   a. $\lambda e^{-\lambda y}$

   b. $-\lambda y$

   c. $\log(y) - \lambda e^{-\lambda y}$

   d. $\log(\lambda) - \lambda y$

a
b
c
d

No, the answer is incorrect.
Score: 0

Accepted Answers:
d

6) *1 point*

6. Suppose we re-define the parameter θ for the problem in Question 5 as $\theta = \frac{1}{\lambda}$, th of the Fisher's Information of θ contained in N observations of the *exponential* whit process is _____

   a. $I(\theta) = -N\theta^2$
   b. $I(\theta) = -N\lambda^2$
   c. $I(\theta) = \frac{N}{\lambda^2}$
   d. $I(\theta) = \frac{N}{\theta^2}$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0

Accepted Answers:
d

7) *1 point*

7. A constant signal of unknown amplitude A is observed by two different, but indepe sensors whose variances are (known to be) σ^2 and $4\sigma^2$, respectively. Suppose a t $N = N_1 + N_2$ observations, with N_1 and N_2 from sensor 1 and sensor 2, respectiv obtained. Given that $N_1, N_2 \geq 2$ (assume that sensor errors are Gaussian white), N_1 and N_2 such that the Fisher's information (about A) in the appended data is ma

   a. $N_1 = N - 2,\ N_2 = 2$
   b. $N_1 = 2,\ N_2 = N - 2$
   c. $N_1 = N_2 = N/2$
   d. None of the above

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0

Accepted Answers:
a

8) *1 point*

8. For a periodic random process with $N_p = 5$, which of the following statements is correct?

   a. $E(v[k+5] - v[k])^2 = 0$
   b. $\sigma_{vv}[l+15] = \sigma_{vv}[l]$
   c. $\sigma_{vv}[10] = \sigma_{vv}[0]$
   d. All of the above

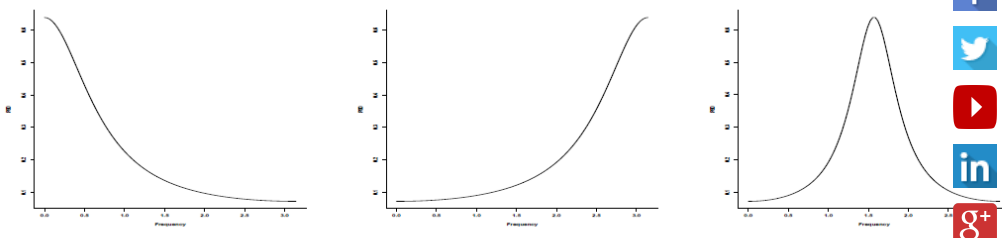
- a
- b
- c
- d

No, the answer is incorrect.
Score: 0

Accepted Answers:
d

9) *1 point*

9. For the time series given in `w8_q9.Rdata`, suppose we estimate the p.s.d of $v[k]$ by a time-series model and using the expression (i.e., Eq. 10 in course notes on *s representations of random processes*) for the p.s.d. Which is the appropriate sk p.s.d?



(a) (b) (c)

- a
- b
- c

No, the answer is incorrect.
Score: 0

Accepted Answers:
a

10) *1 point*

10. Generate a single realization consists of $N = 100$ observations for the given MA(1) p and compute the sample mean.

$$v[k] = e[k] + 0.4e[k-1], \quad e[k] \sim \mathcal{N}(0,1)$$

Repeat this process for 10000 times. The variability of the sample mean is (approxim _____.

a. 0.02
b. 0.2
c. 0.4
d. 1

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0

Accepted Answers:
a

Previous Page End