Started on	Sunday, 8 October 2023, 6:42 PM
State	Finished
Completed on	Sunday, 8 October 2023, 7:14 PM
Time taken	32 mins 34 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Flag question

Consider the fading channel estimation problem with $\bar{\mathbf{x}}$ denoting the real vector of transmitted pilot symbols and $\bar{\mathbf{y}}$ denoting the corresponding received real symbol vector. Let $v(k)$ be i.i.d. Gaussian noise with zero-mean and variance σ^2. The maximum likelihood estimate $\hat{h}$ is,

Select one:

- $h\bar{\mathbf{x}}^T\bar{\mathbf{y}}$
- $\bar{\mathbf{x}}^T\bar{\mathbf{y}}$
- $\frac{\bar{\mathbf{x}}^T\bar{\mathbf{y}}}{\bar{\mathbf{x}}^T\bar{\mathbf{x}}}$ ✔
- h

Your answer is correct.

The correct answer is: $\frac{\bar{\mathbf{x}}^T\bar{\mathbf{y}}}{\bar{\mathbf{x}}^T\bar{\mathbf{x}}}$

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

Let $\bar{\mathbf{x}} = [1 \quad -1 \quad 1 \quad -1]^T$ denote the vector of transmitted pilot symbols and $\bar{\mathbf{y}} = [1 \quad -1 \quad -2 \quad 3]^T$ denote the corresponding received symbol vector. The maximum likelihood estimate of the channel coefficient h is,

Select one:

- $\frac{1}{2}$
- $-\frac{1}{2}$
- $-\frac{3}{4}$ ✔
- $\frac{1}{8}$

Your answer is correct.

The correct answer is: $-\frac{3}{4}$

Question **3**

Correct

Mark 1.00 out of 1.00

Flag question

Consider the fading channel estimation problem with i.i.d. Gaussian noise of zero-mean and variance σ^2 = 2 and pilot vector $\bar{\mathbf{x}} = [1 \quad -1 \quad 1 \quad -1]^T$. The variance of the ML estimate $\hat{h}$ is,

Select one:

- 2
- 1
- $\frac{1}{4}$
- $\frac{1}{2}$ ✔

Your answer is correct.

The correct answer is: $\frac{1}{2}$

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

Consider the fading channel estimation problem $\bar{\mathbf{x}}$ denotes the complex vector of transmitted pilot symbols and $\bar{\mathbf{y}}$ denotes the corresponding received symbol vector. Let v(k) be i.i.d. symmetric complex Gaussian noise with zero-mean and variance σ^2. The maximum likelihood estimate $\hat{h}$ is

Select one:

- $h\bar{\mathbf{x}}^H\bar{\mathbf{y}}$
- $\frac{\bar{\mathbf{x}}^H\bar{\mathbf{y}}}{\bar{\mathbf{x}}^H\bar{\mathbf{x}}}$ ✔
- $\bar{\mathbf{x}}^T\bar{\mathbf{y}}$
- $\frac{\bar{\mathbf{x}}^T\bar{\mathbf{y}}}{\bar{\mathbf{x}}^T\bar{\mathbf{x}}}$

Your answer is correct.

The correct answer is: $\frac{\bar{\mathbf{x}}^H\bar{\mathbf{y}}}{\bar{\mathbf{x}}^H\bar{\mathbf{x}}}$

Question **5**

Correct

Mark 1.00 out of 1.00

Flag question

Consider the fading channel estimation problem where $\bar{\mathbf{x}}$ denotes the complex vector of transmitted pilot symbols. Let v(k) be i.i.d. symmetric complex Gaussian noise with zero-mean and variance σ^2 . The variance of the maximum likelihood estimate $\hat{h}$ is

Select one:

$\frac{\sigma^2}{\bar{\mathbf{x}}^H\bar{\mathbf{x}}}$ ✔

$\frac{\sigma^2}{\bar{\mathbf{x}}^T\bar{\mathbf{x}}}$

$\sigma^2\frac{\bar{\mathbf{x}}^T\bar{\mathbf{y}}}{\bar{\mathbf{x}}^T\bar{\mathbf{x}}}$

$\sigma^2\frac{\bar{\mathbf{x}}^H\bar{\mathbf{y}}}{\bar{\mathbf{x}}^H\bar{\mathbf{x}}}$

Your answer is correct.

The correct answer is: $\frac{\sigma^2}{\bar{\mathbf{x}}^H\bar{\mathbf{x}}}$

Question **6**

Correct

Mark 1.00 out of 1.00

Flag question

Consider the fading channel estimation problem with $\bar{\mathbf{x}} = [1-j \quad -1-j \quad -1+j \quad 1-j]^T$ and $\bar{\mathbf{y}} = [j \quad -1 \quad -j \quad 1]^T$. The maximum likelihood estimate of the channel coefficient h is,

Select one:

$\frac{1}{4}+\frac{1}{4}j$

$-\frac{1}{2}j$

$\frac{1}{4}j$ ✔

$-\frac{1}{2}$

Your answer is correct.

The correct answer is: $\frac{1}{4}j$

Question **7**

Correct

Mark 1.00 out of 1.00

Flag question

Let $\bar{\mathbf{x}} = [1-j \quad -1-j \quad -1+j \quad 1-j]^T$ denote the vector of transmitted pilot symbols and v(k) be symmetric i.i.d. complex Gaussian noise with zero-mean and variance $\sigma^2 = 1$. The variance of the maximum likelihood estimate $\hat{h}$ is,

Select one:

$\frac{1}{8}$ ✔

$\frac{1}{4}$

$\frac{1}{2}$

- $\frac{1}{16}$

Your answer is correct.

The correct answer is: $\frac{1}{8}$

Question **8**

Correct

Mark 1.00 out of 1.00

Flag question

The Cramer-Rao Bound (CRB) is a

Select one:

- Upper bound on variance of parameter estimation
- Lower bound on mean of parameter estimate
- Upper bound on mean of parameter estimate
- Lower bound on variance of parameter estimation ✔

Your answer is correct.

The correct answer is: Lower bound on variance of parameter estimation

Question **9**

Correct

Mark 1.00 out of 1.00

Flag question

The Fisher information I(h) for estimation of a parameter h given the likelihood $p(\bar{\mathbf{y}}; h)$ is

Select one:

- $\frac{1}{E\left\{\left(\frac{\partial}{\partial h}\ln p(\bar{\mathbf{y}}; h)\right)^2\right\}}$
- $E\left\{\frac{\partial}{\partial h}p(\bar{\mathbf{y}}; h)\right\}$
- $E\left\{\left(\frac{\partial}{\partial h}\ln p(\bar{\mathbf{y}}; h)\right)^2\right\}$ ✔
- $E\left\{\left(\frac{\partial}{\partial h}p(\bar{\mathbf{y}}; h)\right)^2\right\}$

Your answer is correct.

The correct answer is: $E\left\{\left(\frac{\partial}{\partial h}\ln p(\bar{\mathbf{y}}; h)\right)^2\right\}$

Question **10**

Correct

Mark 1.00 out of 1.00

Flag question

The Cramer-Rao Bound (CRB) for estimation of a parameter h given the likelihood $p(\bar{\mathbf{y}}; h)$ is

Select one:

- $\frac{1}{E\left\{\left(\frac{\partial}{\partial h}\ln p(\bar{\mathbf{y}};h)\right)^2\right\}}$ ✔
- $\frac{1}{E\left\{\frac{\partial}{\partial h}\ln p(\bar{\mathbf{y}};h)\right\}}$
- $E\left\{\frac{\partial}{\partial h}p(\bar{\mathbf{y}};h)\right\}$
- . $E\left\{\left(\frac{\partial}{\partial h}p(\bar{\mathbf{y}};h)\right)^2\right\}$

Your answer is correct.

The correct answer is: $\frac{1}{E\left\{\left(\frac{\partial}{\partial h}\ln p(\bar{\mathbf{y}};h)\right)^2\right\}}$

Finish review