Started on	Friday, 13 October 2023, 7:42 PM
State	Finished
Completed on	Friday, 13 October 2023, 7:47 PM
Time taken	5 mins 19 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Flag question

False alarm occurs when

Select one:

- The test correctly detects the absence of signal under $\mathcal{H}_0$
- The test falsely detects the presence of signal under $\mathcal{H}_0$ ✔
- The test falsely detects the absence of signal under $\mathcal{H}_1$
- The test correctly detects the presence of signal under $\mathcal{H}_1$

Your answer is correct.

The correct answer is: The test falsely detects the presence of signal under $\mathcal{H}_0$

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

Consider $\bar{\mathbf{s}} = [1 \quad 1 \quad -1 \quad -1]^T$ and $\sigma^2 = \frac{1}{2}$. The distribution of the test statistic $\bar{\mathbf{s}}^T\bar{\mathbf{y}}$ under $\mathcal{H}_0$ is

Select one:

- \mathcal{N}(0,2)

✔

- \mathcal{N}(0,16)
- \mathcal{N}(0,4)
- \mathcal{N}(0,8)

Your answer is correct.

The correct answer is: \mathcal{N}(0,2)

Question **3**

Correct

Mark 1.00 out of 1.00

Flag question

Consider $\bar{\mathbf{s}} = [1 \quad 1 \quad -1 \quad -1]^T, \gamma = 1$ and $\sigma^2 = \frac{1}{2}$. The probability of false alarm for the signal detection problem described in lectures is

Select one:

- $Q\left(\frac{1}{\sqrt{2}}\right)$ ✔
- $Q\left(\frac{1}{4}\right)$
- $Q\left(\frac{1}{2}\right)$
- $Q(1)$

Your answer is correct.

The correct answer is: $Q\left(\frac{1}{\sqrt{2}}\right)$

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

Detection occurs when

Select one:

- The test correctly detects the absence of signal under $\mathcal{H}_0$
- The test falsely detects the absence of signal under $\mathcal{H}_1$
- The test falsely detects the presence of signal under $\mathcal{H}_0$
- The test correctly detects the presence of signal under $\mathcal{H}_1$ ✔

Your answer is correct.

The correct answer is: The test correctly detects the presence of signal under $\mathcal{H}_1$

Question **5**

Correct

Mark 1.00 out of 1.00

Flag question

Consider $\bar{\mathbf{s}} = [1 \quad -1 \quad -1 \quad 1]^T$ and $\sigma^2 = 2$. The distribution of the test statistic $\bar{\mathbf{s}}^T\bar{\mathbf{y}}$ under $\mathcal{H}_1$ is

Select one:

- $\mathcal{N}(2,16)$
- $\mathcal{N}(4,16)$

- $\mathcal{N}(4,8)$ ✔
- $\mathcal{N}(2,4)$

Your answer is correct.

The correct answer is: $\mathcal{N}(4,8)$

Question **6**

Correct

Mark 1.00 out of 1.00

Flag question

Consider $\bar{\mathbf{s}} = [1 \quad -1 \quad -1 \quad 1]^T$, $\gamma = 1$ and $\sigma^2 = 2$. The probability of detection for the signal detection problem described in lectures is

Select one:

- $Q\left(-\frac{1}{2}\right)$
- $Q\left(-\frac{1}{2\sqrt{2}}\right)$
- $Q\left(\frac{1}{\sqrt{2}}\right)$
- $Q\left(-\frac{3}{2\sqrt{2}}\right)$ ✔

Your answer is correct.

The correct answer is: $Q\left(-\frac{3}{2\sqrt{2}}\right)$

Question **7**

Correct

Mark 1.00 out of 1.00

Flag question

As $\gamma \to -\infty$

Select one:

- $P_D \to 0, P_{FA} \to 0$
- $P_D \to 1, P_{FA} \to 1$ ✔
- $P_D \to 0, P_{FA} \to 1$
- $P_D \to 1, P_{FA} \to 0$

Your answer is correct.

The correct answer is: $P_D \to 1, P_{FA} \to 1$

Question **8**

Correct

Mark 1.00 out of 1.00

Flag question

The quantity $Q(x)$, where $Q(\cdot)$ denotes the Gaussian Q −function, equals

Select one:

- $\int_{-\infty}^{-x} \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt$ ✔
- $\int_{-x}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt$
- $\int_{-\infty}^{x} \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt$
- $\int_{-x}^{x} \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt$

Your answer is correct.

The correct answer is: $\int_{-\infty}^{-x} \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt$

Question **9**

Correct

Mark 1.00 out of 1.00

Flag question

For a Gaussian random variable $X \sim \mathcal{N}(1,4)$, the corresponding standard normal can be derived as

Select one:

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

Your answer is correct.

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

Question **10**

Correct

Mark 1.00 out of 1.00

Flag question

The ROC of the signal detection problem is given as

Select one:

- $Q\left(Q^{-1}(P_{FA}) - \sqrt{SNR}\right)$ ✔
- $Q\left(Q^{-1}(P_{FA}) - \sqrt{\frac{1}{SNR}}\right)$
- $Q(Q^{-1}(P_{FA}) - SNR)$
- $Q\left(Q^{-1}(P_{FA}) - \frac{1}{SNR}\right)$

Your answer is correct.

The correct answer is: $Q\left(Q^{-1}(P_{FA}) - \sqrt{SNR}\right)$

Finish review