

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
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False alarm occurs when

Select one:

- ☐ The test correctly detects the absence of signal under Ω_0
- ☒ The test falsely detects the presence of signal under Ω_0 ✓
- ☐ The test falsely detects the absence of signal under Ω_1
- ☐ The test correctly detects the presence of signal under Ω_1

Your answer is correct.

The correct answer is: The test falsely detects the presence of signal under Ω_0

Question **2**
Correct
Mark 1.00 out of 1.00
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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
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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

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As $\gamma \rightarrow -\infty$

Select one:

- ☐ $P_D \rightarrow 0, P_{FA} \rightarrow 0$
- ☒ $P_D \rightarrow 1, P_{FA} \rightarrow 1$ ✓
- ☐ $P_D \rightarrow 0, P_{FA} \rightarrow 1$
- ☐ $P_D \rightarrow 1, P_{FA} \rightarrow 0$

Your answer is correct.

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

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

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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:

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

Your answer is correct.

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

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