Started on	Sunday, 15 October 2023, 5:00 PM
State	Finished
Completed on	Sunday, 15 October 2023, 5:22 PM
Time taken	22 mins 47 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**
Correct
Mark 1.00 out of 1.00
Flag question

The general problem in detection is

Select one:
- Binary hypothesis testing ✔
- Multiple cost determination
- Gaussian discriminant analysis
- Optimal pattern recognition

Your answer is correct.

The correct answer is: Binary hypothesis testing

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

Consider the binary hypothesis testing problem described in lectures with noise variance $\frac{1}{2}$. The distribution of the output under $\mathcal{H}_1$ is

Select one:
- $\mathcal{N}(\bar{\mathbf{s}}, \mathbf{I})$
- $\mathcal{N}(0, \mathbf{I})$
- $\mathcal{N}\left(\|\bar{\mathbf{s}}\|^2, \frac{1}{2}\mathbf{I}\right)$
- $\mathcal{N}\left(\bar{\mathbf{s}}, \frac{1}{2}\mathbf{I}\right)$ ✔

Your answer is correct.

The correct answer is: $\mathcal{N}\left(\bar{\mathbf{s}}, \frac{1}{2}\mathbf{I}\right)$

Question **3**
Correct
Mark 1.00 out of 1.00
Flag question

Consider the binary hypothesis testing problem described in lectures with noise variance σ^2. The likelihood of $\mathcal{H}_0$ is

Select one:
- $\left(\frac{1}{2\pi\sigma^2}\right)^{\frac{N}{2}} e^{-\frac{\sum_{i=1}^{N} y(i)}{2\sigma^2}}$
- $\left(\frac{1}{2\pi\sigma^2}\right)^{\frac{N}{2}} e^{-\frac{\left(\sum_{i=0}^{N} y(i)-s(i)\right)^2}{2\sigma^2}}$
- $\left(\frac{1}{2\pi\sigma^2}\right)^{\frac{N}{2}} e^{-\frac{\sum_{i=0}^{N} \left(y(i)-s(i)\right)^2}{2\sigma^2}}$
- $\left(\frac{1}{2\pi\sigma^2}\right)^{\frac{N}{2}} e^{-\frac{\sum_{i=1}^{N} y^2(i)}{2\sigma^2}}$ ✔

Your answer is correct.

The correct answer is: $\left(\frac{1}{2\pi\sigma^2}\right)^{\frac{N}{2}} e^{-\frac{\sum_{i=1}^{N} y^2(i)}{2\sigma^2}}$

The LRT chooses $\mathcal{H}_1$ if

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

Select one:

- $\frac{p(\bar{y};\mathcal{H}_0)}{p(\bar{y};\mathcal{H}_1)} \geq \tilde{\gamma}$
- $\frac{p(\bar{y};\mathcal{H}_1)}{p(\bar{y};\mathcal{H}_0)} > \tilde{\gamma}$ ✔
- $\frac{p(\bar{y};\mathcal{H}_0)}{p(\bar{y};\mathcal{H}_1)} \geq 1$
- $\frac{p(\bar{y};\mathcal{H}_1)}{p(\bar{y};\mathcal{H}_0)} < \tilde{\gamma}$

Your answer is correct.

The correct answer is: $\frac{p(\bar{y};\mathcal{H}_1)}{p(\bar{y};\mathcal{H}_0)} > \tilde{\gamma}$

Question **5**

Correct

Mark 1.00 out of 1.00

Flag question

Consider $\bar{\mathbf{s}} = [2 \quad -2 \quad -2 \quad 2]^T$. The LRT reduces to the ML decision rule for $\gamma =$

Select one:

- 2
- 4
- 8 ✔
- 16

Your answer is correct.

The correct answer is: 8

Question **6**

Correct

Mark 1.00 out of 1.00

Flag question

Consider $\bar{\mathbf{s}} = \left[\frac{1}{2} \quad \frac{1}{2} \quad -\frac{1}{2} \quad -\frac{1}{2}\right]^T$ and $\sigma^2 = \frac{1}{4}$. The distribution of the test statistic $\bar{\mathbf{s}}^T\bar{\mathbf{y}}$ under $\mathcal{H}_0$ is

Select one:

- $\mathcal{N}\left(0,\frac{1}{8}\right)$
- $\mathcal{N}\left(0,\frac{1}{2}\right)$
- $\mathcal{N}(0,1)$
- $\mathcal{N}\left(0,\frac{1}{4}\right)$ ✔

Your answer is correct.

The correct answer is: $\mathcal{N}\left(0,\frac{1}{4}\right)$

Question **7**

Correct

Mark 1.00 out of 1.00

Flag question

Detection occurs when

Select one:

- The test correctly detects the presence of signal under H_1 ✔
- The test correctly detects the absence of signal under H_0
- The test falsely detects the absence of signal under H_1
- The test falsely detects the presence of signal under H_0

Your answer is correct.

The correct answer is: The test correctly detects the presence of signal under H_1

Question **8**
Correct
Mark 1.00 out of 1.00
Flag question

Consider $\bar{\mathbf{s}} = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} \end{bmatrix}^T$ and $\sigma^2 = 2$. The distribution of the test statistic $\bar{\mathbf{s}}^T\bar{\mathbf{y}}$ under $\mathcal{H}_1$ is

Select one:
- $\mathcal{N}(1,2)$ ✔
- $\mathcal{N}(2,2)$
- $\mathcal{N}\left(\frac{1}{2},4\right)$
- $\mathcal{N}\left(\frac{1}{2},1\right)$

Your answer is correct.

The correct answer is: $\mathcal{N}(1,2)$

Question **9**
Correct
Mark 1.00 out of 1.00
Flag question

Consider $\bar{\mathbf{s}} = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} \end{bmatrix}^T$, $\gamma = 2$ 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: $Q\left(\frac{1}{\sqrt{2}}\right)$

Question **10**
Correct
Mark 1.00 out of 1.00
Flag question

The ROC of the signal detection problem is given as

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

Your answer is correct.

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

[Finish review]