Started on	Monday, 30 October 2023, 9:00 PM
State	Finished
Completed on	Monday, 30 October 2023, 9:14 PM
Time taken	14 mins 43 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Flag question

The probability of error for detection can be evaluated as

Select one:

- $\Pr(\mathcal{H}_0)\, P_{FA} + \Pr(\mathcal{H}_1)\, P_D$
- $\Pr(\mathcal{H}_1)\, P_{FA} + \Pr(\mathcal{H}_0)\, P_D$
- $\Pr(\mathcal{H}_0)\, P_{FA} + \Pr(\mathcal{H}_1)\, P_{MD}$ ✔
- $\Pr(\mathcal{H}_1)\, P_{FA} + \Pr(\mathcal{H}_0)\, P_{MD}$

Your answer is correct.

The correct answer is: $\Pr(\mathcal{H}_0)\, P_{FA} + \Pr(\mathcal{H}_1)\, P_{MD}$

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

The probability of error for the ML detector in the signal detection problem is

Select one:

- $Q\left(\frac{\|\bar{s}\|}{\sigma}\right)$
- $Q\left(\frac{2\|\bar{s}\|}{\sigma}\right)$
- $Q\left(\frac{\|\bar{s}\|^2}{2\sigma^2}\right)$
- $Q\left(\frac{\|\bar{s}\|}{2\sigma}\right)$ ✔

Your answer is correct.

The correct answer is: $Q\left(\frac{\|\bar{s}\|}{2\sigma}\right)$

Question **3**

Correct

Mark 1.00 out of 1.00

Flag question

For the Amplitude Shift Keying (ASK) constellation with $\frac{E_b}{N_0} = 9\ dB$, the BER is given as

Select one:

- $Q(1)$

- $Q(\sqrt{2})$
- $Q(2)$
- $Q(2\sqrt{2})$ ✔

Your answer is correct.

The correct answer is: $Q(2\sqrt{2})$

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

Let detector choose $\mathcal{H}_1$ when $\bar{\mathbf{y}} \in R_1$ and $\mathcal{H}_0$ when $\bar{\mathbf{y}} \in R_0$. We must have

Select one:

- $\int_{R_1} p(\bar{\mathbf{y}}; \mathcal{H}_0)\, d\bar{\mathbf{y}} + \int_{R_1} p(\bar{\mathbf{y}}; \mathcal{H}_1)\, d\bar{\mathbf{y}} = 1$
- $\int_{R_1} p(\bar{\mathbf{y}}; \mathcal{H}_0)\, d\bar{\mathbf{y}} + \int_{R_0} p(\bar{\mathbf{y}}; \mathcal{H}_0)\, d\bar{\mathbf{y}} = 1$ ✔
- $\int_{R_1} p(\bar{\mathbf{y}}; \mathcal{H}_0)\, d\bar{\mathbf{y}} + \int_{R_0} p(\bar{\mathbf{y}}; \mathcal{H}_1)\, d\bar{\mathbf{y}} = 1$
- $\int_{R_1} p(\bar{\mathbf{y}}; \mathcal{H}_1)\, d\bar{\mathbf{y}} + \int_{R_0} p(\bar{\mathbf{y}}; \mathcal{H}_0)\, d\bar{\mathbf{y}} = 1$

Your answer is correct.

The correct answer is: $\int_{R_1} p(\bar{\mathbf{y}}; \mathcal{H}_0)\, d\bar{\mathbf{y}} + \int_{R_0} p(\bar{\mathbf{y}}; \mathcal{H}_0)\, d\bar{\mathbf{y}} = 1$

Question **5**

Correct

Mark 1.00 out of 1.00

Remove flag

The optimal detector for the binary hypothesis testing according to the Neyman-Pearson (NP) criterion is given by the

Select one:

- Maximum Likelihood
- Minimum Mean Squared Error
- Likelihood Ratio Test ✔
- Maximum Aposteriori Probability Rule

Your answer is correct.

The correct answer is: Likelihood Ratio Test

Question **6**

Correct

Mark 1.00 out of 1.00

Flag question

The P_{FA} for the generalized signal detection problem is

Select one:

- $Q\left(\frac{\gamma}{\sigma\|\bar{s}_1-\bar{s}_0\|}\right)$ ✔
- $Q\left(\frac{\gamma}{\sigma\|\bar{s}_1+\bar{s}_0\|}\right)$
- $Q\left(\frac{\gamma}{\sigma\|\bar{s}_1\|}\right)$
- $Q\left(\frac{\gamma}{\sigma\|\bar{s}_0\|}\right)$

Your answer is correct.

The correct answer is: $Q\left(\frac{\gamma}{\sigma\|\bar{s}_1-\bar{s}_0\|}\right)$

Question **7**

Correct

Mark 1.00 out of 1.00

Flag question

Consider the generalized signal detection problem with

$$\bar{s}_0 = \begin{bmatrix} -1 \\ 1 \\ 1 \\ -1 \end{bmatrix}, \bar{s}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

Let $\sigma^2 = 8$. The probability of error for the ML detector with equiprobable signals is

Select one:

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

Your answer is correct.

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

Question **8**

Correct

Mark 1.00 out of 1.00

Flag question

For same energy per bit E_b,

Select one:

- ASK is 3 dB more efficient than BPSK
- Both ASK and BPSK have the same BER
- BPSK is 3 dB more efficient than ASK ✔
- There is no relation between BER of BPSK and ASK

Your answer is correct.

The correct answer is: BPSK is 3 dB more efficient than ASK

Question **9**

Correct

Mark 1.00 out of 1.00

Flag question

In the multiple hypothesis testing problem, the decision region for each hypothesis is

Select one:

- (selected) In general a polyhedron ✔
- Always square
- Always rectangle
- Always a parallelogram

Your answer is correct.

The correct answer is: In general a polyhedron

Question **10**

Correct

Mark 1.00 out of 1.00

Flag question

The union bound on the probability of error for an $M - ary$ constellation is

Select one:

- $\frac{1}{M}\sum_i N^i_{min} Q\left(\frac{d^i_{min}}{\sigma}\right)$
- (selected) $\frac{1}{M}\sum_i N^i_{min} Q\left(\frac{d^i_{min}}{2\sigma}\right)$ ✔
- $\frac{1}{M}\sum_i Q\left(\frac{d^i_{min}}{2\sigma}\right)$
- $\frac{1}{M}\sum_i N^i_{min} Q(d^i_{min})$

Your answer is correct.

The correct answer is: $\frac{1}{M}\sum_i N^i_{min} Q\left(\frac{d^i_{min}}{2\sigma}\right)$

Finish review