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:

○ $Q\left(\frac{\|s\|}{\sigma}\right)$

○ $Q\left(\frac{2\|s\|}{\sigma}\right)$

○ $Q\left(\frac{\|s\|^2}{2\sigma^2}\right)|$

◉ $Q\left(\frac{\|s\|}{2\sigma}\right)$ ✔

Your answer is correct.

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

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:

○ $\int_{R_1}^{\square} p(\bar{\mathbf{y}}; \mathcal{H}_0)\, d\bar{\mathbf{y}} + \int_{R_1}^{\square} p(\bar{\mathbf{y}}; \mathcal{H}_1)\, d\bar{\mathbf{y}} = 1$

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

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

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

Your answer is correct.

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

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:

○ 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:

○ $\frac{1}{M} \sum_i N^i_{min} Q \left(\frac{d^i_{min}}{\sigma} \right)$

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

○ $\frac{1}{M} \sum_i Q \left(\frac{d^i_{min}}{2\sigma} \right)$

○ $\frac{1}{M} \sum_i N^i_{min} Q \left(d^i_{min} \right)$

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](#)