Started on Friday, 24 November 2023, 1:12 AM

State Finished

Completed on Friday, 24 November 2023, 9:02 PM

Time taken 19 hours 50 mins

Grade 10.00 out of 10.00 (100%)

Question 1

Correct

Mark 1.00 out of 1.00

Flag question

Let U denote a central χ^2_{20} RV. Then, $E\{U\}$ equals

Select one:

- 20
- **5**
- 0 400
- 0 40

Your answer is correct.

The correct answer is: 20

Question **2**

Correct

Mark 1.00 out of 1.00

 $\slash\hspace{-0.6em}{
ho}$ Flag question

Let U denote a central χ^2_{20} RV. Then, variance of U equals

Select one:

- 0 120
- **20**
- 0 400
- 40

Your answer is correct.

The correct answer is: 40

Question $\bf 3$

Correct

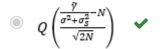
Mark 1.00 out of 1.00

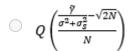
♥ Flag question

Using the central limit theorem, the P_D for the energy detector can be approximated as

Select one:

$$Q\left(\frac{\sqrt[\tilde{\gamma}]{\sigma^2 + \sigma_s^2} - 2N}{\sqrt{N}}\right)$$





$$Q\left(\frac{\frac{\gamma}{\sigma^2 + \sigma_s^2} - 2N}{\sqrt{2N}}\right)$$

Your answer is correct.

The correct answer is: $Q\left(\frac{\sqrt[p]{\sigma^2 + \sigma_s^2} - N}{\sqrt{2N}}\right)$

Question 4

Correct

Mark 1.00 out of 1.00

The GLRT problem described in lectures is

Select one:

- $\mathcal{H}_0: \overline{\mathbf{y}} = \overline{\mathbf{v}}, \mathcal{H}_1: \overline{\mathbf{y}} = A\overline{\mathbf{s}} + \overline{\mathbf{v}}, \text{ where } A \text{ is unknown and } \overline{\mathbf{s}} \text{ is known}$
- $\bigcirc \quad \mathcal{H}_0 \colon \overline{\mathbf{y}} = \overline{\mathbf{v}}, \mathcal{H}_1 \colon \overline{\mathbf{y}} = A\overline{\mathbf{s}} + \overline{\mathbf{v}}, \text{ where } A, \overline{\mathbf{s}} \text{ are unknown}$
- $\bigcirc \quad \mathcal{H}_0 \colon \overline{\mathbf{y}} = \overline{\mathbf{v}}, \mathcal{H}_1 \colon \overline{\mathbf{y}} = A\overline{\mathbf{s}} + \overline{\mathbf{v}}, \text{ where } \overline{\mathbf{s}} \text{ is unknown and } A \text{ is unknown}$
- $\bigcirc \quad \mathcal{H}_0 \colon \overline{\mathbf{y}} = \overline{\mathbf{v}}, \mathcal{H}_1 \colon \overline{\mathbf{y}} = A\overline{\mathbf{s}} + \overline{\mathbf{v}}, \text{ where } A, \overline{\mathbf{s}} \text{ are known}$

Your answer is correct.

The correct answer is: $\mathcal{H}_0: \bar{\mathbf{y}} = \bar{\mathbf{v}}, \mathcal{H}_1: \bar{\mathbf{y}} = A\bar{\mathbf{s}} + \bar{\mathbf{v}}$, where A is unknown and $\bar{\mathbf{s}}$ is known

Question **5**

Correct

Mark 1.00 out of 1.00

In the GLRT, the ML estimate of the parameter A is

Select one:

- $\bar{\mathbf{s}}^T\bar{\mathbf{y}}$

- $\frac{||\vec{s}||}{\vec{s}^T \vec{y}}$

Your answer is correct.

The correct answer is: $\frac{\bar{s}^T \bar{y}}{\|\bar{s}\|^2}$

Question 6

Correct

Mark 1.00 out of 1.00 № Flag question

The GLRT for the signal detection problem with unknown scaling parameter is given as

Select one:

- Ohoose \mathcal{H}_0 if $|\bar{\mathbf{s}}^T\bar{\mathbf{y}}| \leq \gamma$
- $\bigcirc \quad \text{Choose } \mathcal{H}_0 \text{ if } \mathbf{\bar{s}}^T \mathbf{\bar{y}} \geq \gamma$
- Ohoose \mathcal{H}_0 if $\bar{\mathbf{s}}^T \bar{\mathbf{y}} \leq \gamma$
- $\bigcirc \quad \text{Choose } \mathcal{H}_0 \text{ if } |\bar{\mathbf{s}}^T \bar{\mathbf{y}}| \geq \gamma$

Your answer is correct.

The correct answer is: Choose \mathcal{H}_0 if $|\bar{\mathbf{s}}_{\underline{\mathbf{r}}}^T \bar{\mathbf{y}}| \leq \gamma$

Question **7**

Correct

Mark 1.00 out of 1.00

Consider $\gamma = 8$, $\sigma^2 = 8$, $\bar{s} = \begin{bmatrix} 1 & -1 & 1 & -1 \end{bmatrix}^T$. P_{FA} for the GLRT described in class is

Select one:

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

Your answer is correct.

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

Question 8

Correct

Mark 1.00 out of 1.00

 $P_{\scriptscriptstyle D}$ for the GLRT described in class is

Select one:

- $\bigcirc Q\left(\frac{\gamma A\|\bar{s}\|^2}{\sigma\|\bar{s}\|}\right)$
- $\bigcirc Q(\gamma A \|\overline{s}\|^2) + Q(\gamma + A \|\overline{s}\|^2)$
- $\bigcirc Q\left(\frac{\gamma A||\bar{s}||^2}{||\bar{s}||^2}\right) + Q\left(\frac{\gamma + A||\bar{s}||^2}{||\bar{s}||^2}\right)$
- $@ Q\left(\frac{\gamma A||\overline{s}||^2}{\sigma||\overline{s}||}\right) + Q\left(\frac{\gamma + A||\overline{s}||^2}{\sigma||\overline{s}||}\right) \checkmark$

Your answer is correct.

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

Question 9

Correct

Mark 1.00 out of 1.00

Cognitive Radio allows

Select one:

- Secondary users to always access licensed spectrum
- Secondary users to access licensed spectrum when there is a spectral hole
- Primary users to access spectrum only in limited slots
- Primary users to access spectrum only in limited slots

Your answer is correct.

The correct answer is: Secondary users to access licensed spectrum when there is a spectral hole

Question 10

Correct

Mark 1.00 out of 1.00

The probability of detection for spectrum sensing is

Select one:

- $\bigcirc \quad Q_{\chi^2_{2N}}\left(\frac{\gamma}{\sigma^2+\sigma_s^2}\right)$
- $Q_{\chi_{2N}^2}\left(\frac{\gamma}{\sqrt{\frac{\sigma^2+\sigma_s^2}{2}}}\right)$
- $Q_{\chi^2_{2N}}\left(\frac{\gamma}{(\sigma^2+\sigma^2_s)/2}\right)$
- $Q_{\chi_{2N}^2} \left(\frac{\gamma}{\sqrt{\sigma^2 + \sigma_c^2}} \right)$

Your answer is correct.

The correct answer is: $Q_{\chi^2_{2N}}\left(\frac{\gamma}{\left(\sigma^2+\sigma^2_s\right)/2}\right)$

Finish review