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
- 400
- 40

Your answer is correct.

The correct answer is: 20

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

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

Select one:

- 120
- 20
- 400
- 40 ✔

Your answer is correct.

The correct answer is: 40

Question **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:

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

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

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

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

Your answer is correct.

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

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

The GLRT problem described in lectures is

Select one:

- $\mathcal{H}_0 : \bar{\mathbf{y}} = \bar{\mathbf{v}}, \mathcal{H}_1 : \bar{\mathbf{y}} = A\bar{\mathbf{s}} + \bar{\mathbf{v}}$, where A is unknown and $\bar{\mathbf{s}}$ is known ✓
- $\mathcal{H}_0 : \bar{\mathbf{y}} = \bar{\mathbf{v}}, \mathcal{H}_1 : \bar{\mathbf{y}} = A\bar{\mathbf{s}} + \bar{\mathbf{v}}$, where $A, \bar{\mathbf{s}}$ are unknown
- $\mathcal{H}_0 : \bar{\mathbf{y}} = \bar{\mathbf{v}}, \mathcal{H}_1 : \bar{\mathbf{y}} = A\bar{\mathbf{s}} + \bar{\mathbf{v}}$, where $\bar{\mathbf{s}}$ is unknown and A is unknown
- $\mathcal{H}_0 : \bar{\mathbf{y}} = \bar{\mathbf{v}}, \mathcal{H}_1 : \bar{\mathbf{y}} = A\bar{\mathbf{s}} + \bar{\mathbf{v}}$, where $A, \bar{\mathbf{s}}$ 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

Flag question

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

Select one:

- $\bar{\mathbf{s}}^T\bar{\mathbf{y}}$
- $\frac{\bar{\mathbf{s}}^T\bar{\mathbf{y}}}{\|\bar{\mathbf{s}}\|^2}$ ✓
- $\frac{\bar{\mathbf{s}}^T\bar{\mathbf{y}}}{\|\bar{\mathbf{s}}\|}$
- $\frac{\|\bar{\mathbf{s}}\|}{\bar{\mathbf{s}}^T\bar{\mathbf{y}}}$

Your answer is correct.

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

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:

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

Your answer is correct.

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

Question **7**

Correct

Mark 1.00 out of 1.00

Flag question

Consider $\gamma = 8$, $\sigma^2 = 8$, $\bar{\mathbf{s}} = [1 \quad -1 \quad 1 \quad -1]^T$. P_{FA} for the GLRT described in class is

Select one:

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

Your answer is correct.

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

Question **8**

Correct

Mark 1.00 out of 1.00

Flag question

P_D for the GLRT described in class is

Select one:

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

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

Flag question

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

Flag question

The probability of detection for spectrum sensing is

Select one:

- $Q_{\chi^2_{2N}}\left(\frac{\gamma}{\sigma^2+\sigma_s^2}\right)$
- $Q_{\chi^2_{2N}}\left(\frac{\gamma}{\sqrt{\frac{\sigma^2+\sigma_s^2}{2}}}\right)$
- $Q_{\chi^2_{2N}}\left(\frac{\gamma}{(\sigma^2+\sigma_s^2)/2}\right)$ ✔
- $Q_{\chi^2_{2N}}\left(\frac{\gamma}{\sqrt{\sigma^2+\sigma_s^2}}\right)$

Your answer is correct.

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

Finish review