Started on	Sunday, 26 November 2023, 5:30 PM
State	Finished
Completed on	Sunday, 26 November 2023, 6:24 PM
Time taken	53 mins 57 secs
Grade	**9.00** out of 10.00 (**90**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Remove flag

The integral $\int_{-\infty}^{\infty} a^2 e^{-a^2} da$ evaluates to

Select one:

- 0
- $\frac{\sqrt{\pi}}{2\sqrt{2}}$
- $\frac{\sqrt{\pi}}{2}$ ✔
- $\sqrt{\frac{\pi}{2}}$

Your answer is correct.

The correct answer is: $\frac{\sqrt{\pi}}{2}$

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

SER of M −ary QAM for $SNR = \rho$ is

Select one:

- $4\left(1-\frac{1}{\sqrt{M}}\right)Q\left(\sqrt{\frac{3\rho}{(M-1)}}\right)$ ✔
- $4\left(1-\frac{1}{\sqrt{M}}\right)Q\left(\sqrt{\frac{\rho}{(M-1)}}\right)$
- $\left(1-\frac{1}{\sqrt{M}}\right)Q\left(\sqrt{\frac{3\rho}{(M-1)}}\right)$
- $4\left(1-\frac{1}{M}\right)Q\left(\sqrt{\frac{3\rho}{(\sqrt{M}-1)}}\right)$

Your answer is correct.

The correct answer is: $4\left(1-\frac{1}{\sqrt{M}}\right)Q\left(\sqrt{\frac{3\rho}{(M-1)}}\right)$

Question **3**

Incorrect

Mark 0.00 out of 1.00

Remove flag

Let x_i denote i.i.d. zero-mean Gaussian random variables with $\sigma = 2$. Then, $\sum_{i=1}^{N} x_i^2$ equals the random variable

Select one:

- χ_N^2 ✖
- $\frac{1}{2}\chi_N^2$
- $2\chi_N^2$
- $4\chi_N^2$

Your answer is incorrect.

The correct answer is: $4\chi_N^2$

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

The PDF of χ_N^2-**Central chi-squared RV** with N **degrees of freedom** is

Select one:

- $\frac{1}{2^{\frac{N}{2}-1}\Gamma\left(\frac{N}{2}\right)} x^{\frac{N}{2}} e^{-\frac{1}{2}x},\ x \geq 0$
- $\frac{1}{2^{\frac{N}{2}}\Gamma\left(\frac{N}{2}\right)} x^{\frac{N}{2}-1} e^{-\frac{1}{2}x},\ x \geq 0$ ✔
- $\frac{1}{2^{\frac{N}{2}}\Gamma(N)} x^{\frac{N}{2}-1} e^{-x},\ x \geq 0$
- $\frac{1}{2^{\frac{1}{2}}\Gamma\left(\frac{1}{2}\right)} x^{\frac{N}{2}-1} e^{-\frac{1}{2}x},\ x \geq 0$

Your answer is correct.

The correct answer is: $\frac{1}{2^{\frac{N}{2}}\Gamma\left(\frac{N}{2}\right)} x^{\frac{N}{2}-1} e^{-\frac{1}{2}x},\ x \geq 0$

Question **5**

Correct

Mark 1.00 out of 1.00

Flag question

The P_D for the random signal detection problem is

Select one:

- $Q_{\chi_N^2}\left(\frac{\gamma}{\sigma^2+\sigma_s^2}\right)$ ✔
- $\frac{\Gamma\left(\frac{N}{2}, \frac{\gamma}{\sigma^2+\sigma_s^2}\right)}{\Gamma\left(\frac{N}{2}\right)}$
- $Q\left(\frac{\gamma}{\sigma^2+\sigma_s^2}\right)$
- $\frac{\Gamma\left(\frac{N}{2}, \frac{\gamma}{\sigma^2}\right)}{\Gamma\left(\frac{N}{2}\right)}$

Your answer is correct.

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

Question **6**

Correct

Mark 1.00 out of 1.00

Flag question

Let U denote a central χ^2_{50} RV. Then, variance of U equals

Select one:

- 100 ✔
- 2500
- 200
- 400

Your answer is correct.

The correct answer is: 100

Question **7**

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 $A, \bar{\mathbf{s}}$ 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 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 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 **8**

Correct

Mark 1.00 out of 1.00

Flag question

Consider $\gamma = 4, \sigma^2 = 4, \bar{\mathbf{s}} = [1 \quad -1 \quad 1 \quad -1]^T$. P_{FA} for the GLRT described in class is

Select one:

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

- $Q(2)$

Your answer is correct.

The correct answer is: $2Q(1)$

Question **9**

Correct

Mark 1.00 out of 1.00

Flag question

Cognitive Radio allows

Select one:

- Secondary users to always access licensed spectrum
- Primary users to access spectrum only in limited slots
- Primary users to sense the spectrum before accessing
- Secondary users to access licensed spectrum when there is a spectral hole ✔

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 for $N = 10, \sigma^2 = 2, \sigma_s^2 = 10$, is

Select one:

- $Q_{\chi^2_{20}}\left(\frac{\gamma}{12}\right)$
- $Q_{\chi^2_{20}}\left(\frac{\gamma}{6}\right)$ ✔
- $Q_{\chi^2_{10}}\left(\frac{\gamma}{12}\right)$
- $Q_{\chi^2_{10}}\left(\frac{\gamma}{6}\right)$

Your answer is correct.

The correct answer is: $Q_{\chi^2_{20}}\left(\frac{\gamma}{6}\right)$

Finish review