Unit 7 - Principles of CDMA and MIMO Wireless Communication

Course outline

How to Access the Portal ?

Introduction to Wireless Systems

Performance in Fading wireless channels

Multiple Antenna Wireless Systems and Diversity

Wireless Channel Characterization - Delay Spread and Doppler

Principles of CDMA Wireless Communication

Principles of CDMA and MIMO Wireless Communication

- Analysis of Multi-user CDMA
- Multipath Diversity in CDMA Systems
- Near-Far Problem in CDMA
- Multiple Input Multiple Output (MIMO) Systems
- Examples of MIMO Systems
- Quiz : Assignment-6
- Assignment-6 Solution

Principles of MIMO Wireless Communication (Continued)

Principles of OFDM Wireless Communication

Text Transcription

Unit-0

Assignment-6

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-10-09, 23:59 IST.

1) If each chip $c_0(n)$ and $c_1(n)$ can be $+1, -1$ with probability 0.25, 0.75 each and chips $c_0(n), c_1(n)$ are independent, the average value $E\{r_{01}\}$ and second moment $E\{r_{01}^2\}$ respectively of the cross correlation $r_{01} = \frac{1}{N}\sum_n c_0(n)c_1(n)$ are given as, *1 point*

- $\frac{1}{4}, \frac{1}{N}$
- $-\frac{1}{4}, \frac{1}{N}$
- $\frac{1}{2}, \frac{1}{N}$
- $-\frac{1}{2}, \frac{1}{N}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{4}, \frac{1}{N}$

2) For an LFSR composed of D shift registers, the total number of runs and the length of maximal length sequence will be, [correct] *1 point*

- $2^{D-1}, 2^D - 1$
- $2^D, 2^{D-1} - 1$
- $2^D, 2^D - 1$
- $2^{D-2}, 2^D - 1$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$2^{D-1}, 2^D - 1$

3) Consider a CDMA scenario with 20 users i.e. $k = 0, 1, \ldots, 19$. Let the channel coefficient for the 0^{th} user be $\frac{1}{\sqrt{3}} + j\frac{1}{\sqrt{3}}$ and dB Power P_i of each user be 9 dB. Spreading length $N = 512$. What is the SINR of user 0? The dB Noise power $\sigma^2 = -3$ dB, [correct] *1 point*

- 12.28 dB
- 13.28 dB
- 14.28 dB
- 15.28 dB

No, the answer is incorrect.
Score: 0
Accepted Answers:
14.28 dB

4) The principle employed by the Rake receiver is *1 point*

- Summation across chips followed by thresholding
- Correlation with delayed versions of code followed by maximum ratio combining
- Matched filtering followed by thresholding
- Correlation with delayed versions of code followed by summation

No, the answer is incorrect.
Score: 0
Accepted Answers:
Correlation with delayed versions of code followed by maximum ratio combining

5) The transmission of multiple information streams in parallel in a MIMO system with multiple transmit antennas and multiple receive antennas is termed as *1 point*

- Multi-user transmission
- Multi-to-Multi Streaming
- Spatial Multiplexing
- Information Multiplexing

No, the answer is incorrect.
Score: 0
Accepted Answers:
Spatial Multiplexing

6) The size of the noise vector at the receiver of a 5×3 MIMO system is *1 point*

- Vector of size 5
- Vector of size 3
- Scalar quantity
- 5×3 matrix

No, the answer is incorrect.
Score: 0
Accepted Answers:
Vector of size 5

7) The zero-forcing receiver for $r > t$ uses the *1 point*

- Inverse of the channel matrix H
- Singular value decomposition of H
- Pseudo-inverse of H
- Eigenvector of H

No, the answer is incorrect.
Score: 0
Accepted Answers:
Pseudo-inverse of H

8) Consider the channel matrix H given as *1 point*

$$H = \begin{bmatrix} 1 & -1 \\ 3 & 0 \\ -1 & 2 \end{bmatrix}$$

The corresponding zero-forcing receiver matrix is

- $\begin{bmatrix} 2 & 15 & 1 \\ -8 & 9 & 19 \end{bmatrix}$
- $\begin{bmatrix} \frac{2}{46} & \frac{15}{46} & \frac{1}{46} \\ -\frac{8}{46} & \frac{9}{46} & \frac{19}{46} \end{bmatrix}$
- $\begin{bmatrix} \frac{1}{46} & \frac{15}{46} & -\frac{1}{46} \\ -\frac{8}{46} & \frac{9}{46} & \frac{19}{46} \end{bmatrix}$
- $\begin{bmatrix} 1 & -1 \\ \frac{1}{3} & 0 \\ -1 & \frac{1}{2} \end{bmatrix}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\begin{bmatrix} \frac{2}{46} & \frac{15}{46} & \frac{1}{46} \\ -\frac{8}{46} & \frac{9}{46} & \frac{19}{46} \end{bmatrix}$

9) Consider symbols $x_1 = 2 + j$ and $x_2 = 3 - j$ for an Alamouti coded 1×2 wireless system. The symbol vector transmitted during the second time instant in this system is given as, *1 point*

- $[-2 + j \quad 3 + j]^T$
- $[2 + j \quad 3 - j]^T$
- $[3 + j \quad 2 + j]^T$
- $[-3 - j \quad 2 - j]^T$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$[-3 - j \quad 2 - j]^T$

10) Consider an Alamouti coded system and it is targeted to achieve a BER of 3×10^{-10}. What is the SNR required to achieve this BER? *1 point*

- 47.61 dB
- 16.28 dB
- 19.29 dB
- 50 dB

No, the answer is incorrect.
Score: 0
Accepted Answers:
50 dB