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NPTEL

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Courses » Information Theory, Coding and Cryptography

Announcements **Course** Ask a Question Progress Mentor FAQ

Unit 12 - Week 11

Course outline

- How to access the portal
- Week 1
- Week 2
- Week 3
- Week 4
- Week 5
- Week 6
- Week 7
- Week 8
- Week 9
- Week 10
- Week 11
  - Introduction to Space Time Block Codes (STBC)
  - Real Orthogonal Design and Complex Orthogonal Design

Assignment 11

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

Due on 2018-10-17, 23:59 IST.

1) The Alamouti code is given by *1 point*

- $X = \begin{bmatrix} x_1 & x_2 \\ x_2^* & x_1^* \end{bmatrix}$
- $X = \begin{bmatrix} x_1 & x_2 \\ -x_2^* & x_1 \end{bmatrix}$
- $X = \begin{bmatrix} x_1 & x_2 \\ -x_2 & x_1^* \end{bmatrix}$
- $X = \begin{bmatrix} x_1 & x_2 \\ -x_2^* & x_1^* \end{bmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$X = \begin{bmatrix} x_1 & x_2 \\ -x_2^* & x_1^* \end{bmatrix}$

2) Suppose we have a 2 X 1 wireless system that employs Alamouti code and uses QPSK modulation with Gray coding. If the input bit-stream is 1 0 1 0 1 0 1 1 1 0 0 1 …. then the transmitted symbols from antenna 2 will be *1 point*

- $s_1\ s_3^*\ s_3\ s_2^*\ s_1 - s_3^*$
- $s_2\ s_3^*\ s_3 - s_1^*\ s_1\ s_3^*$
- $s_3\ s_3^*\ s_3\ s_2^*\ s_1\ s_3^*$
- $s_2\ s_3^*\ s_3\ s_2^*\ s_1\ s_2$

Quiz : Assignment 11

Week 12

Additional Lectures

Consider the code given by $G = \begin{bmatrix} x_1 & -x_2^* & x_3^* & 0 \\ x_2 & x_1^* & 0 & x_3^* \\ x_3 & 0 & -x_1^* & -x_2^* \\ 0 & x_3 & x_2 & -x_1 \end{bmatrix}$. The values of N, K and T are

- N = 4, K = 2, T = 4
- N = 4, K = 3, T = 3
- N = 3, K = 3, T = 4
- N = 4, K = 3, T = 4

No, the answer is incorrect.
Score: 0

Accepted Answers:
N = 4, K = 3, T = 4

4) Consider the code given by $G = \begin{bmatrix} x_1 & x_3 & x_2 \\ -x_2 & -x_4 & x_1 \\ -x_3 & x_1 & x_4 \\ -x_4 & x_2 & -x_3 \end{bmatrix}$. Which of the following statements is corect ***1 point***

- It is orthogonal
- it is delay optimal
- N = 3, T = 4
- All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above

5) The rank criteria suggests that in order to achieve maximum diversity ***1 point***

- The matrix $A(C^i, C^j)$ should be of full rank for any two codewords, $C^i \neq C^j$
- The matrix $A(C^i, C^j)$ should be orthogonal for any two codewords, $C^i \neq C^j$
- The matrix $A(C^i, C^j)$ should be unitary for any two codewords, $C^i \neq C^j$
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
The matrix $A(C^i, C^j)$ should be of full rank for any two codewords, $C^i \neq C^j$

6) The determinant criteria suggests that in order to achieve maximum coding gain ***1 point***

- The maximum determinant of the matrix $A(C^i, C^j)$ should be minimized for any two codewords, $C^i \neq C^j$
- The minimum determinant of the matrix $A(C^i, C^j)$ should be maximized for any two codewords, $C^i \neq C^j$
- The minimum determinant of the matrix $A(C^i, C^j)$ should be minimized for any two codewords, $C^i \neq C^j$
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
The minimum determinant of the matrix $A(C^i, C^j)$ should be maximized for any two codewords, $C^i \neq C^j$

7) Orthogonal Space-time block codes provide **1 point**

- Simple decoding
- Maximum diversity
- Both a. and b.
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both a. and b.

8) A real orthogonal design of size N is an NXN generator matrix such that **1 point**

- $G^T G = \left(\sum_{i=1}^{N} x_i \right) I_N$
- $G^T G = \left(\sum_{i=1}^{N} |x_i| \right) I_N$
- $G^T G = \left(\sum_{i=1}^{N} x_i^2 \right) I_N$
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
$G^T G = \left(\sum_{i=1}^{N} x_i^2 \right) I_N$

9) A real orthogonal design exists if and only if N is equal to **1 point**

- 2
- 4
- 8
- All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above

10 **1 point**

For $G_{434} = \begin{bmatrix} x_1 & -x_2^* & -x_3^* & 0 \\ x_2 & x_1^* & 0 & x_3^* \\ x_3 & 0 & x_1^* & -x_2^* \\ 0 & -x_3 & x_2 & x_1 \end{bmatrix}$, the rate, R, is

- 1
- 1/2
- 2/3
- 3/4

No, the answer is incorrect.
Score: 0

Accepted Answers:
3/4

Previous Page

End