Assignment 6

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

Due on 2018-09-12, 23:59 IST.

1) Two $k \times n$ matrices generate equivalent linear $(n, k)$ codes over $GF(q)$ if one matrix can be obtained from the other by

- Permutation of rows
- Addition of a scalar multiple of one row to another
- Permutation of columns
- All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of the above

2) A generator matrix can be reduced to its Systematic Form of the type $G = [I | P]$ where

- $I$ is a $k \times k$ identity matrix and $P$ is a $k \times k$ matrix
- $I$ is a $k \times k$ identity matrix and $P$ is a $k \times (n-k)$ matrix
- $I$ is a $n \times k$ identity matrix and $P$ is a $k \times (n-k)$ matrix
- $I$ is a $n \times n$ identity matrix and $P$ is a $n \times (n-k)$ matrix

No, the answer is incorrect.
Score: 0
Accepted Answers:
$I$ is a $k \times k$ identity matrix and $P$ is a $k \times (n-k)$ matrix

3) Consider a $(7, 4)$ code with $G = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$. Choose the option which does not list a valid codeword.

- 0001101
- 0110100
- 1110000
- 1111111

No, the answer is incorrect.
Score: 0
Accepted Answers:
1110000

4) Consider the $(23, 12, 7)$ binary code. If it is used over a binary symmetric channel (BSC) with probability of bit error $p = 0.01$, the word error will be approximately

- 0.00001

No, the answer is incorrect.
Score: 0
Accepted Answers:
1110000
5) Consider a linear block code over GF(11) with blocklength \( n = 10 \), satisfying the following two constraints:
\[
\sum_{i=0}^{9} c_i = 0 \text{ calculated (mod 11)} \text{ and } \sum_{i=0}^{9} (10-i)c_i = 0 \text{ calculated (mod 11)}
\]
The minimum distance of this code is

- 0
- 1
- 2
- 3

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

6) Let \( C \) be a binary perfect code of block length \( n \) with minimum distance 7. A possible value of \( n \) can be

- 15
- 21
- 23
- 33

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

7) Let \( r_H \) denote the code rate for the binary Hamming code. The limit \( r_H \) is given by

- 0
- 0.5
- 1.0
- infinity

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

8) The next-generation spacecraft to Mars, Mangalyan X, would be sending color photographs over a binary symmetric satellite channel that has a reliability of 0.999 and is subject to randomly scattered noise. The spacecraft creates photographs using pixels of 128 different colors. Thus each color is a codeword. The space mission would like the probability of a pixel in the received image being assigned an incorrect color to be less than 0.0001. The parameters \((n, k, d^*)\) of the most efficient linear code that could be used by the spacecraft would be

- (15, 7, 3)
- (11, 7, 3)
- (31, 11, 5)
- (15, 11, 5)

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

9) The next-generation spacecraft to Mars, Mangalyan X, would be sending color photographs over a binary symmetric satellite channel that has a reliability of 0.999 and is subject to randomly scattered noise. The spacecraft creates photographs using pixels of 128 different colors. Thus each color is a codeword. The space mission would like the probability of a pixel in the received image being assigned an incorrect color to be less than 0.0001. The parameters \((n, k, d^*)\) of the most efficient linear code that could be used by the spacecraft would be

- (15, 7, 3)
- (11, 7, 3)
- (31, 11, 5)
- (15, 11, 5)

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

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No, the answer is incorrect.
Score: 0
Accepted Answers:
(11, 7, 3)

10) The generator matrix, \( G_2 = \begin{bmatrix} x_1 & x_2 \\ -x_2 & x_1 \end{bmatrix} \), corresponds to

- real orthogonal design
- generalized real orthogonal design
- complex orthogonal design
- generalized complex orthogonal design

No, the answer is incorrect.
Score: 0
Accepted Answers:
real orthogonal design

11) The code matrix of the Alamouti scheme is given by

\( X = \begin{bmatrix} x_1 & x_2 \\ -x_2 & x_1 \end{bmatrix} \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\( X = \begin{bmatrix} x_1 & x_2 \\ -x_2 & x_1 \end{bmatrix} \)