



Prof. M. Gastpar

Quiz 5 (Homeworks 10 & 11)

Due on Moodle

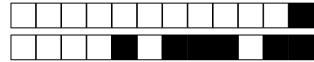
on Monday, May 12, 2025, at 23:59.

# Quiz 5

SCIPER: 111111

- This quiz is to be solved individually.
- Try not to use any of the course materials other than the formula collection on a first attempt.
- Once you are done, enter your answers into Moodle. Moodle will give you feedback. You can update your answers as many times as you want before the deadline.
- For each question there is **exactly one** correct answer. We assign **negative points** to the **wrong answers** in such a way that a person who chooses a wrong answer loses **25 %** of the points given for that question.

Respectez les consignes suivantes   Observe this guidelines   Beachten Sie bitte die unten stehenden Richtlinien		
choisir une réponse   select an answer Antwort auswählen	ne PAS choisir une réponse   NOT select an answer NICHT Antwort auswählen	Corriger une réponse   Correct an answer Antwort korrigieren
<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/>
ce qu'il ne faut PAS faire   what should NOT be done   was man NICHT tun sollte		
<input checked="" type="checkbox"/>		

**Question 1**

[7 points] Consider a communication system consisting of a binary block code with codeword uniformly at random chosen, an error channel, and a minimum-distance decoder. Check the correct statement about the minimum-distance decoder.

- None of the others can be stated with certainty due to missing information.
- It minimizes the error probability if the channel is a binary symmetric channel with crossover (flip) probability smaller than 1/2.
- It always minimizes the error probability.
- It minimizes the error probability if the channel is a binary symmetric channel.

**Question 2**

[7 points] Note: This is an **open** question. In the real exam, we will grade your arguments. Here for the quiz, we do not have the capacity to do this. Therefore, you will merely enter your final answer into a multiple choice grid on Moodle. However, do make sure to carefully look at the solution and compare to your answer. How many points would you have given yourself?

How many  $x \in \mathbb{Z}/23\mathbb{Z}$  satisfy the equation  $0 = 1 - x + x^2 - x^3 + \dots - x^{21} + x^{22} - x^{23}$ , when all operations are with respect to the field  $(\mathbb{Z}/23\mathbb{Z}, +, \cdot)$ ? Input the number of  $x$ 's satisfying the equation (an integer between 0 to 23).

**Question 3**

[6 points] Let  $E$  be a subspace of  $\mathbb{F}_7^4$  which consists of elements  $\vec{x} = (x_1, x_2, x_3, x_4)$  satisfying,

$$x_1 + 6x_2 + 3x_3 + 4x_4 = 0$$

$$3x_1 + 6x_2 + x_3 + 3x_4 = 0$$

$$5x_1 + 2x_2 + x_3 + 3x_4 = 0$$

What is the dimension of  $E$ ? Check the correct answer.

- 2.
- 0.
- 4.
- 3.
- 1.