Problem 1

Give the addition, multiplication and power table of GF(7)!
Solve the following equation over GF(7)
$6x+3=6$

Solution: Ezek meg vannak adva ZH-n

Let's write down the addition and multiplication table of GF(7)

+	0	1	2	3	4	5	6
0	0	1	2	3	4	5	6
1	1	2	3	4	5	6	0
2	2	3	4	5	6	0	1
3	3	4	5	6	0	1	2
4	4	5	6	0	1	2	3
5	5	6	0	1	2	3	4
6	6	0	1	2	3	4	5

*	0	1	2	3	4	5	6
0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6
2	0	2	4	6	1	3	5
3	0	3	6	2	5	1	4
4	0	4	1	5	2	6	3
5	0	5	3	1	6	4	2
6	0	6	5	4	3	2	1

Let's write down the power table of all the elements of GF(7)

α^i in GF(7):

$\alpha \setminus i$	1	2	3	4	5	6	7
1	1	1	1	1	1	1	1
2	2	4	1	2	4	1	2
3	3	2	6	4	5	1	3
4	4	2	1	4	2	1	4
5	5	4	6	2	3	1	5
6	6	1	6	1	6	1	6
7	0	0	0	0	0	0	0

so the primitive elements are 3 and 5

Problem 2

Give the addition, multiplication and power table of GF(7)!

Determine the value of the following determinant over GF(5)

$$\det\begin{bmatrix} 2 & 1 & 2 \\ 1 & 3 & 2 \\ 1 & 0 & 1 \end{bmatrix} = ?$$

Problem 3

Give the addition, multiplication and power table of GF(11)!

Solve the following equation over GF(11)
$7x-4=2$

Problem 4

Given an RS code capable to correct every two error over GF(7), generated by the largest primitive element of the field.

a) Give the code parameters!
b) Construct the generator matrix!
c) Construct the parity check matrix!

Given a $C(6,3)$ RS code which is generated by the largest primitive element of the field.

a) construct the generator matrix!

b) construct the parity check matrix!

c) How many error can be corrected with this code?

Problem 6

We design an RS code over GF(11), which we want to correct every 3 errors using the largest possible message length.

a) Give code parameters n,k !

b) Construct the parity check matrix !
