Started on	Tuesday, 12 December 2023, 2:15 PM
State	Finished
Completed on	Tuesday, 12 December 2023, 3:00 PM
Time taken	44 mins 35 secs
Grade	**40.00** out of 100.00

Question **1**

Correct

Mark 10.00 out of 10.00

Flag question

Given a linear binary code with following parity check matrix:

$$\mathbf{H} = \begin{pmatrix} 0 & 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 & 1 \end{pmatrix}$$

At the transmitter side message vector $\mathbf{u} = (001)$ is transmitted, while at the receiver side vector $\mathbf{v} = (11001)$ is received.

Determine the error vector which is added to the transmitted codeword when passing through the noisy channel! (10p)

Expected format: sequence of zeros and ones with brackets, for example: (1001001) or (11111). (The vectors in the examples do not necessarily have the same dimension as the solution!)

Answer: (11111) ✓

The correct answer is: (11111)

Question **2**

Partially correct

Mark 1.00 out of 5.00

Flag question

Determine what error vector will be identified at the receiver side by running the error correction algorithm ! (5p)
Expected format: sequence of zeros and ones with brackets, for example: (1001001) or (11111). (The vectors in the examples do not necessarily have the same dimension as the solution!)

Answer: (10111) ✗

The correct answer is: (01000)

Question **3**

Incorrect

Mark 0.00 out of 5.00

Flag question

What is the detected message vector at the receiver side? (5p)
Expected format: sequence of zeros and ones with brackets, for example: (1001001) or (11111). (The vectors in the examples do not necessarily have the same dimension as the solution!)

Answer: (11001) ✗

The correct answer is: (100)

Question **4**

Incorrect

Mark 0.00 out of 20.00

Flag question

Indicate the correct statements by a tick! (20p)

To score 20p you must indicate all the correct statements, otherwise 0p is given!

Select one or more:

- a. At the receiver side of the generic binary error ✗

Question **4**

Incorrect

Mark 0.00 out of 20.00

Flag question

Indicate the correct statements by a tick! (20p)

To score 20p you must indicate all the correct statements, otherwise 0p is given!

Select one or more:

- [x] a. At the receiver side of the generic binary error correcting coding scheme we always pick the detected codeword which has the maximum Hamming distance with the received vector. ✗
- [ ] b. The public key of RSA algorithm includes the multiplication of two prime numbers.
- [ ] c. The average code length achieved by the Huffman code cannot be smaller than the source entropy.
- [ ] d. In the case of public-key cryptography the receiver deciphers the cyphertext by his public key.
- [x] e. In the case of binary linear codes, we always pick that error vector from the group of error vectors belonging to the same syndrome vector which has maximal weight. ✗

The correct answers are:
The average code length achieved by the Huffman code cannot be smaller than the source entropy.,

The public key of RSA algorithm includes the multiplication of two prime numbers.

Question **5**

Incorrect

Mark 0.00 out of 6.00

Flag question

Given a source with the following distribution:

$p_1 = 0.08333\dot{}$

$p_2 = 0.41666\dot{}$

$p_3 = 0.41666\dot{}$

$p_4 = 0.08333\dot{}$

What is the average codelength if we compress the source by Huffman coding? (6p)

Expected format: a number, between 0 and 1, ***rounded to two decimal places****, for example: 0.901 or 0.034*

Answer: 0.750 ✗

The correct answer is: 1.75

Question **6**

Incorrect

Mark 0.00 out of 7.00

Flag question

What is the average codelength if we compress the source by Shannon-Fano coding? (7p)

Expected format: a number, between 0 and 1, ***rounded to two decimal places****, for example: 0.901 or 0.034*

Question **6**

Incorrect

Mark 0.00 out of 7.00

Flag question

What is the average codelength if we compress the source by Shannon-Fano coding? (7p)

*Expected format: a number, between 0 and 1, **rounded to two decimal places**, for example: 0.901 or 0.034*

Answer: 0.333 ✗

The correct answer is: 2.33

Question **7**

Correct

Mark 7.00 out of 7.00

Flag question

What is the difference in data speed between Shannon Fano and Huffman coding at $f_s = 100MHz$ sampling frequency? Please give the result in **Mbps**! (7p)

*Expected format: a number, between 0 and 1, **rounded to two decimal places**, for example: 0.901 or 0.034*

Answer: 0.377 ✗

The correct answer is: 58.33

Question **8**

Incorrect

Mark 0.00 out of 6.00

Flag question

What is the initial depth (the longest length of paths from the root node to the leaves) of the binary tree of adaptive Huffman coding having 8 source symbols? (6p)

Expected format: a number, for example: 17 or 3.

Answer: 0 ✗

The correct answer is: 3

Question **9**

Correct

Mark 7.00 out of 7.00

Flag question

By what polynom we divide the shifted version of the received polynom in the shift register placed in the middle of the three shift register in the Error Trapping Algorithm? (7p)

Select one:

- Parity check polynom
- Generator polynom ✓
- Error polynom

The correct answer is:
Generator polynom

Question **10**

Incorrect

A *C(n,k)* Reed Solomon code correcting every triple errors over

Question **10**
Incorrect
Mark 0.00 out of 4.00
Flag question

A *C(n,k)* Reed Solomon code correcting every triple errors over GF(16)!

What is the value of the parameter *n*? (4p)

Expected format: a number, for example: 17 or 3.

Answer: 6 ✗

The correct answer is: 15

Question **11**
Incorrect
Mark 0.00 out of 3.00
Flag question

What is the value of the parameter *k*? (3p)

Expected format: a number, for example: 17 or 3.

Answer: 0 ✗

The correct answer is: 9

Question **12**
Correct
Mark 3.00 out of 3.00
Flag question

Given a Reed Solomon code over GF(4) capable of correcting every single error!

What is the value of the parameter *n*? (3p)

Expected format: a number, for example: 17 or 3.

Answer: 3 ✓

The correct answer is: 3

Question **13**
Correct
Mark 2.00 out of 2.00
Flag question

What is the value of the parameter *k*? (2p)

Expected format: a number, for example: 17 or 3.

Answer: 1 ✓

The correct answer is: 1

Question **14**
Correct
Mark 10.00 out of 10.00
Flag question

Determine the generator polyonom! In the result please give only the coefficients of *x*! (10p)

*Expected format: sequence of comma-separated numbers, without spaces, for example: 1,2,8,10 or 1,3,5,7,9,4,2. For example if the generator polinom is $x^3 + 5x^2 + 2x + 5$, then the expected solution is **1,5,2,5**. (The vectors in the examples do not necessarily have the same dimension as the solution!)*

Question 12

Correct

Mark 3.00 out of 3.00

Flag question

Given a Reed Solomon code over GF(4) capable of correcting every single error!

What is the value of the parameter *n*? (3p)

Expected format: a number, for example: 17 or 3.

Answer: 3

The correct answer is: 3

Question 13

Correct

Mark 2.00 out of 2.00

Flag question

What is the value of the parameter *k*? (2p)

Expected format: a number, for example: 17 or 3.

Answer: 1

The correct answer is: 1

Question 14

Correct

Mark 10.00 out of 10.00

Flag question

Determine the generator polyonom! In the result please give only the coefficients of *x*! (10p)

*Expected format: sequence of comma-separated numbers, without spaces, for example: 1,2,8,10 or 1,3,5,7,9,4,2. For example if the generator polinom is $x^3 + 5x^2 + 2x + 5$, then the expected solution is **1,5,2,5**. (The vectors in the examples do not necessarily have the same dimension as the solution!)*

The power table over GF(4) is:

y^0	1
y	y
y^2	$y+1$
y^3	1
y^4	y

Answer: 1,1,1

The correct answer is: 1,1,1

Question 15

Incorrect

Mark 0.00 out of

Determine the codevector which belongs to the message vector the components of which is all 3. (5p)

Expected format: sequence of comma-separated numbers, in

Question 13

Correct

Mark 2.00 out of 2.00

Flag question

What is the value of the parameter *k*? (2p)

Expected format: a number, for example: 17 or 3.

Answer: 1 ✓

The correct answer is: 1

Question 14

Correct

Mark 10.00 out of 10.00

Flag question

Determine the generator polyonom! In the result please give only the coefficients of *x*! (10p)

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The power table over GF(4) is:

y^0	1
y	y
y^2	$y+1$
y^3	1
y^4	y

Answer: 1,1,1 ✓

The correct answer is: 1,1,1

Question 15

Incorrect

Mark 0.00 out of 5.00

Flag question

Determine the codevector which belongs to the message vector the components of which is all 3. (5p)

Expected format: sequence of comma-separated numbers, in brackets, without spaces, for example: (1,2,8,10) or (1,3,5,7,9,4,2).

Answer: (3,3,2,3,3) ✗

The correct answer is: (3,3,3)

Finish review