5. Problem Sheet

Out	Due	Discussion
17. 05. 17	23. 05. 17	26. 05. 17 - 30. 05. 17

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Please solve the problems in groups with two people and submit your solutions before the lecture. The discussion of the problem sheet is in the exercise course after the submission.

Problem 5.1: Multiplexing and Multiple Access

2+2 = 4 points

- Discuss the terms multiplexing and multiple access and give examples.
- How do these terms relate to the duplex, half-duplex, or simplex properties of particular network technologies?

Problem 5.2: Hamming-Code

1+2+2 = 5 points

Two entities have agreed to use the following encoding to transmit characters:

Character	Code Word
A	10000
B	01000
C	11000
D	00100
...	...
Z	01011

1. How many check bits are required to correct all 1-bit errors in messages with a length of m bits?
2. A Hamming Code with 4 check bits shall be used in the following. Create the code words which represent the word HAMMING.
3. Consider the following code words have been received:

   010101000 111001000 010101001 001011000 111111100 001001100

   Decode this sequence, mark the blocks that contain an error, and correct the errors if possible.

Problem 5.3: Generator Polynomial

4×1 *= 4 points*

The bit sequence 10100001 has to be transmitted. Use $x^3 + 1$ for the generator polynomial of a CRC.

1. Calculate the check sum.
2. Name the bit sequence for the transmission.
3. How can the receiver check the correctness of the bit sequence? Show the calculation.
4. Assumed there is a bit error on the third bit. Show how the receiver recognizes the error.

Problem 5.4: Cyclic Redundancy Checksum *3 points*

Determine if the following bit sequences have been transmitted error-free. Use the generator polynomial G to apply a CRC check.

$$G(x) = x^4 + x + 1$$

If you find an error in a bit sequence, assume that the checksum bits contain the error. Recalculate the checksum.

	Data + CRC
1.	0111 0110 0010
2.	0101 0010 1001
3.	1111 0110 1100

Problem 5.5: CRC in Header or Trailer *1 point*

Most data link layer protocols store the CRC value in the trailer rather than the header. Discuss why this is a common approach.

Problem 5.6: LLC vs. MAC *3 points*

Discuss the difference tasks of the LLC and MAC.

a total of 20 points