

Surname, Name, Matr.: Signature:

Questions

1. A block code is described by the parity check matrix indicated in Fig. 1.

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

- Indicate the possible code-words.
 - What is the probability of error in case of hard and soft decision ?
 - What is the minimum required bandwidth (in case of binary modulation) if the information bit-rate is equal to 10 Mbit/s.
2. Consider a convolutional code with $R = 2/3$, and octal generators (17, 06, 15).
- Determine and draw the block diagram of the coder.
 - Determine the paths of the trellis diagram starting from the all zeros state.
 - Describe the general expression of the bit-error probability, and the minimal bandwidth required in case of an information bit-rate equal to 10 Mbit/sec.
3. Indicate the detailed block diagram of a turbo encoder and decoder, indicating clearly the significance of the used symbols.
4. OFDM
- Describe the channel equalization procedure performed in the OFDM modulation systems.
 - Indicate the main advantages and disadvantages of the OFDM modulation systems.
5. DSSS-CDMA
- Describe why and when a DSSS modulation system is robust against multi-path fading.
 - Describe the basic idea of the Rake Receiver, indicating also why this is working properly in the case of DSSS modulation.
6. CPM
- Describe the basic parameters of the MSK modulation system.
 - Describe the major strategies used to simplify the CPM receivers.