Project # 1

Modern Coding Theory
Spring, 2022

☐ Due : April 20, 2022

☐ Topic

- Performance of Turbo codes based on the BCJR algorithm

☐ Assumption

- AWGN channels are assumed.
- The BCJR algorithm is used for decoding.
- The number of iterations is limited by 6, 8, 10, 15, 20.
- Random interleavers are assumed
- The interleaver sizes are 200, 500 and 1000.
- The RSC code as a component code has one of the following transfer matrices:

1) $G(D) = \left[1 \quad \frac{1+D^4}{1+D+D^4}\right]$

2) $G(D) = \left[1 \quad \frac{1+D^2+D^4}{1+D+D^4}\right]$

3) $G(D) = \left[1 \quad \frac{1+D+D^2+D^4}{1+D+D^4}\right]$

4) $G(D) = \left[1 \quad \frac{1+D^3+D^4}{1+D+D^4}\right]$

5) $G(D) = \left[1 \quad \frac{1+D+D^3+D^4}{1+D+D^4}\right]$

6) $G(D) = \left[1 \quad \frac{1+D^4}{1+D^3+D^4}\right]$

7) $G(D) = \begin{bmatrix} 1 & \frac{1+D+D^4}{1+D^3+D^4} \end{bmatrix}$

8) $G(D) = \begin{bmatrix} 1 & \frac{1+D^2+D^4}{1+D^3+D^4} \end{bmatrix}$

9) $G(D) = \begin{bmatrix} 1 & \frac{1+D+D^2+D^4}{1+D^3+D^4} \end{bmatrix}$

10) $G(D) = \begin{bmatrix} 1 & \frac{1+D+D^3+D^4}{1+D^3+D^4} \end{bmatrix}$

☐ Output

(1) Source file and execution file

(2) Report (hard copy and soft copy)

- Report should be written in a paper style. In other words, Introduction, main body describing an algorithm and what to do, Numerical Results and Discussion, and Conclusions should be included.
- Simulation results should include BER curves wrt. E_{b}/N_0.

☐ Tools

- C/C++ (strongly recommended)
- Matlab (permitted)