4. Calculate the delay spread, the Root-Mean-Square (RMS) delay spread and the mean delay spread of the channel described in the table below. What is the channel coherence bandwidth? Is the channel frequency selective or frequency flat for WCDMA, with a signal bandwidth of 3.84 MHz?

i	1	2	3	4
τ_i [μs]	0	0.1	1	2
P_i [dB]	0	0	-3	-6

5. Assume a Tapped Delay Line channel model $h = [1 \;\; 0.5 \;\; 0.2]$

   a) Express the received signal model after this channel and with additive white Gaussian noise.

   b) If you estimate a symbol without equalization from the received signal with the timing of the first channel tap, what is the signal-to-interference ratio casused by inter-symbol-interference?

   c) How would the transmitted signal power spectrum density look like? (Assume perfect sinc-waveforms at the transmitter.)

   d) How would the signal power spectrum look like after the channel? Illustrate the spectrum by drawing examples. It is sufficient to calculate the power spectrum density at four discrete points, given by a Discrete Fourier Transform of the channel. The 4-point DFT matrix is

$$\mathbf{W} = \frac{1}{2}\begin{bmatrix} 1 & -1 & 1 & -1 \\ 1 & -\mathrm{j} & -1 & \mathrm{j} \\ 1 & 1 & 1 & 1 \\ 1 & \mathrm{j} & -1 & -\mathrm{j} \end{bmatrix}.$$

   e) How would the spectrum look like after linear zero forcing (ZF) equalizer?

   f) Why is a minimum mean square error (MMSE) equalizer preferable to a ZF equalizer?