Set #5

Due Date Monday November 15

Problems

1. Z&T 9.46. This problem is similar to text Example 9.11. Numerical solutions are expected. I have modified the problem to use the channel pulse response:
```
pc = array([0,0,0.02,0,0,-0.11,0.1,-0.6,1.0,-0.4,0.5,0.18,0,0,
            0.01,0,0])
```
   and now want you to consider $N = 5, 15$, and 30, where $N_{\text{taps}} = 2N+1$. This means you now have parts (a), (b) and (c) to work through. You will see how the equalizer performs when the channel is set inside a system with square-root raised cosine pulse shaping at tx and rx in Problem 3 below. As a code base use the Equalizers Jupyter notebook ZIP we have been using in class, as a starting point for this problems and others that follow. I have recently added a decision feedback equalizer to this ZIP, but it is not fully debugged.
2. Z&T 9.47. To check your analysis obtain numerical results for the special case of $b = 0.5$ and $\text{SNR} = 10\,\text{dB}$.
3. Simulation extension to Z&T 9.46. In this problem I want you to use the shaped modulation framework for zero-forcing and obtain BEP curves with $N = 5, 15,$ and, 30, where $N_{\text{taps}} = 2N+1$.
4. Z&T 10.6.
5. Z&T 10.12.

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6. 20 bonus points: I am still debugging the DFE code in the notebook linked in Problem 1. If you can help me resolve the error(s) and then compare the BEP performance of the (i) linear DD MMSE equalizer with (ii) the non-linear DFE MMSE. Assume the simple Butterworth channel filter that is already integrated into the simulation models of the notebook.