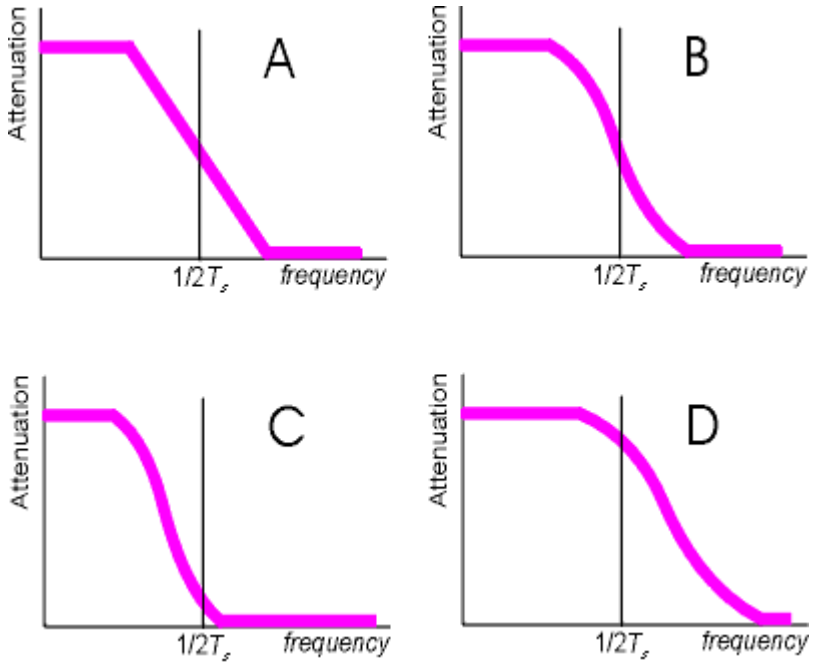
Principles of Communication Systems (EENGM0033)

BASEBAND PROBLEM SHEET

1. Which of the filter responses shown here exhibit the correct properties for achieving zero intersymbol interference in a filtered data scheme?



2. Sketch the eye diagram for 4-level amplitude shift keying, assuming noise-free operation with:

   a. an infinite operating bandwidth and no pulse shaping

   b. a root raised cosine channel with $\alpha = 0.5$.

3. A baseband binary data link is capable of supporting a bit rate of 4800 bps when using a raised cosine filter with an α of 0.6.

   How much faster could information be sent if the value of α was reduced to 0.2?

4. A 16 symbol state baseband modulation technique requires an α of 1 for reliable transmission. What is the maximum data rate that can be supported on this link, assuming a noise-free channel and a bandwidth of 3200 Hz?

5. A baseband cable modem is able to achieve a symbol error rate of 1 in 10^6 with binary signalling. With reference to the plot of symbol error rate vs E_b/N_0 for M-ary signalling (given in the notes), determine the approximate error rate that will result for the same E_b/N_0 value if a four-level modulation format were to be deployed.

6. A 64-level modulation format is measured as giving a symbol error probability of 2 in 10^5 at an E_b/N_0 value of 23 dB. What is the approximate bit error rate for the system, assuming that Gray coding has been used?