

EECS 307 — Homework #6
2/12/20 (due Friday 2/21)

Z&T (Ed. 6): 9.1, 9.2 parts a and b only

3. Compute the average power in a 4-ary ASK signal as a function of the distance between constellation points. How much more power does 4-ary ASK require, relative to BPSK, assuming the distance between the constellation points is the same? Express in dB.

4. Suppose a commercial FM superhet receiver has been designed such that the image frequency always falls below the broadcast band. Using the FM parameters below, find the minimum value of f_{IF} , the corresponding range of f_{LO} , and the bounds on the bandwidth of the front-end RF bandpass filter.

FM Carrier frequency:	88.1 - 107.9 MHz
Carrier spacing:	200 kHz
IF bandwidth:	200-250 kHz
Audio bandwidth:	15 kHz

5. Consider a superhet intended for USB-SSB modulation with $W = 4$ kHz and $f_c = 3.57 - 3.63$ MHz. Take $f_{LO} = f_c + f_{IF}$ and choose the receiver parameters so that all bandpass stages have $B/f_0 \approx 0.02$ where B is the filter bandwidth and f_0 is the center frequency. Then sketch $|H_{RF}(f)|$ to show that the RF stage can be fixed-tuned. Also sketch $|H_{IF}(f)|$, accounting for sideband reversal.