1. A multilevel baseband digital communication system operates at a bit rate of 1.5 Mbps.
   (a) If 4-bit symbols are encoded, determine the minimum bandwidth required by the channel.
   (b) If 8-bit symbols are encoded, determine the minimum bandwidth required by the channel.

2. Consider a random data pattern consisting of binary 1’s and 0’s. The data pattern is encoded and transmitted over a baseband communication channel at a rate of 1.0 Mbps.
   (a) Determine the PSD for Bipolar NRZ signaling where the amplitude of a symbol is 3.3V.
   (b) Determine the PSD for Bipolar RZ signaling where the amplitude of a symbol is 3.3V.
   (c) Plot the PSD’s for (a) and (b) above and compare them.

3. The information in an analog signal is A/D converted and encoded into binary PCM. The PCM signal is then encoded into an 8-symbol signal for transmission across a baseband channel. The analog signal has a bandwidth of 2,700 Hz and the quantization error must be less than 1% of the full-scale input voltage.
   (a) Determine the minimum bit rate of the PCM signal.
   (b) Determine the symbol rate of the baseband communication signal.
   (c) Determine the minimum channel bandwidth.
   (d) Determine the PSD of the transmitted signal for the mapping
   \[ b[n] \in \{-4, -3, -2, -1, 1, 2, 3, 4\} \]