1. Write a Matlab code that does the following

Accepts Three (N x 1) arrays termed as SPN (Signal + Noise), CN (Channel Noise), TxMASK (Transmit PSD mask).

Performs multicarrier Capacity computations and obtains an integer tone loading profile using Threshold of 9.8db (for BER of 10-5), a margin of 6 dB with a RS coding gain of 2.5 dB.

The number of bits per loaded tone should be capped to 20.

In case a particular tone can be loaded with one bit only, pair the same with another one bit loaded tone or blackout the particular tone and add the bit to another tone that supports more than one bit.

The number of tones to be used is 256, each with a bandwidth of 4 KHz and a sub carrier spacing of 4.3125 KHz. The OFDM symbol rate is 4KSps.

The inputs are provided below.

*Remember it is the modem that has to perform computations under a time constraint, and obviously the computations should not be intensive. Take care to avoid repeated intensive computations.*

You are required to show the following

1. Stem plot of bits loaded per tone without any rounding.
2. Stem plot after up and down rounding on per tone basis.
3. Stem plot of fine gain values not exceeding Mask by +2 dB. (Total power is integrated value of PSD Mask should not be exceeded).
4. Data Structures you have actively used.
5. A diary of your computation showing the total time.

* Array SPN is assumed to be provided in the table below.

|  |  |
| --- | --- |
| Tone numbers | SPN value |
| Upto 5 | Blackout |
| 6 - 32 | -40 dbm |
| 33 - 50 | -50 dbm |
| 51 - 70 | -60 dbm |
| 71 - 100 | -70 dbm |
| 101 - 150 | -80 dbm |
| 151 – 200 | -90 dbm |
| 201 – 220 | -110 dbm |
| 220 - 254 | -125 dbm |
| 255 | Blackout |

* The Channel Noise array can be populated at a constant value of -132 dbm/Hz.
* Transmit PSD is given in figure below

