EEE F311 COMMUNICATION SYSTEMS

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SECTION: P1

Experiment 8: Line Coding

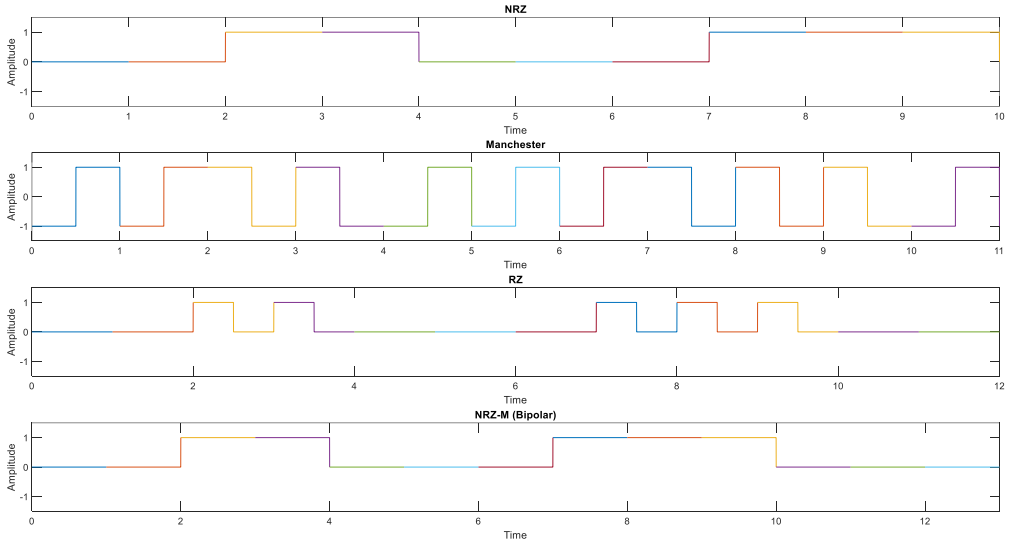
Aim: This experiment is intended to make the students generate line codes corresponding to random bit sequences and examine their time- and frequency-domain properties.

A – Observations on the random bit pattern in both Time and Frequency domains

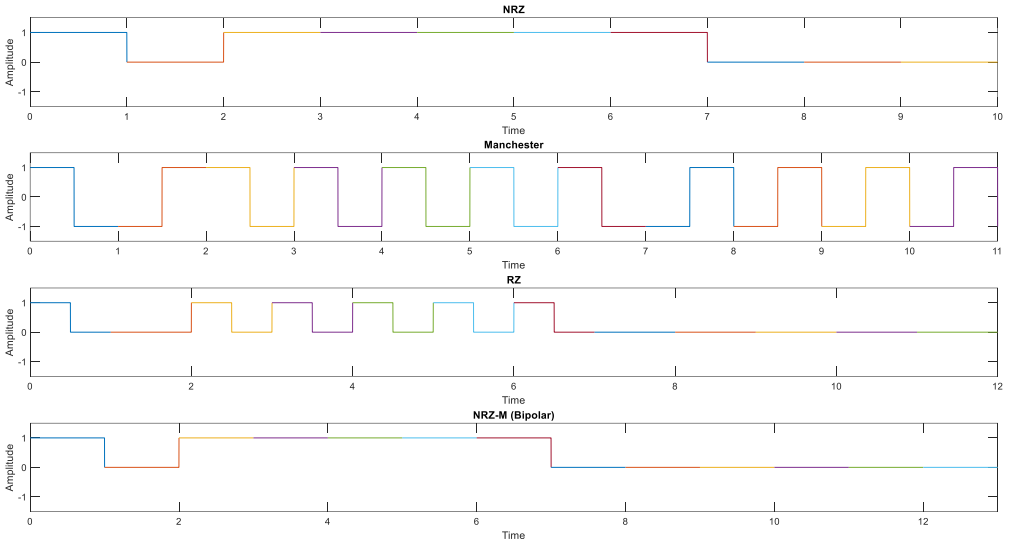
```
input =

     0     1     1     0     1     0     0     1     1     1
```

1.
2. Rb = 10 bits/sec ,Bit period = 1/Rb = 1/10 = 0.1 sec
3. Code in A3



4. Code in A4



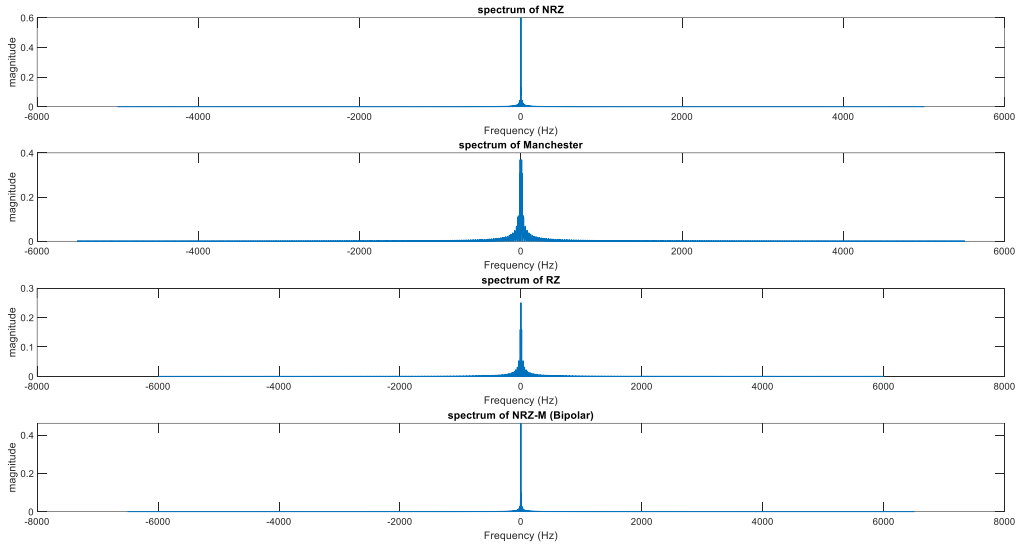


Table 2: Time & Spectral Domain Properties of line codes (NRZ)

Digital Bit	Line code Voltage	Bit Rate R_b	Power At 0 Hz	First Deep Null Frequency	Power at First deep null	Essential BW / R_b
1	+1	10	0.09	2.5	0.00332	0.25
0	-1	10				

Table 3: Time & Spectral Domain Properties of line codes (MANCHESTER)

Digital Bit	Line code Voltage	Bit Rate R_b	Power At 0 Hz	First Deep Null Frequency	Power at First deep null	Essential BW / R_b
1	-1 -> +1	10	0	2.0	0.00152	0.20
0	+1 -> -1	10				

Table 4: Time & Spectral Domain Properties of line codes (RZ)

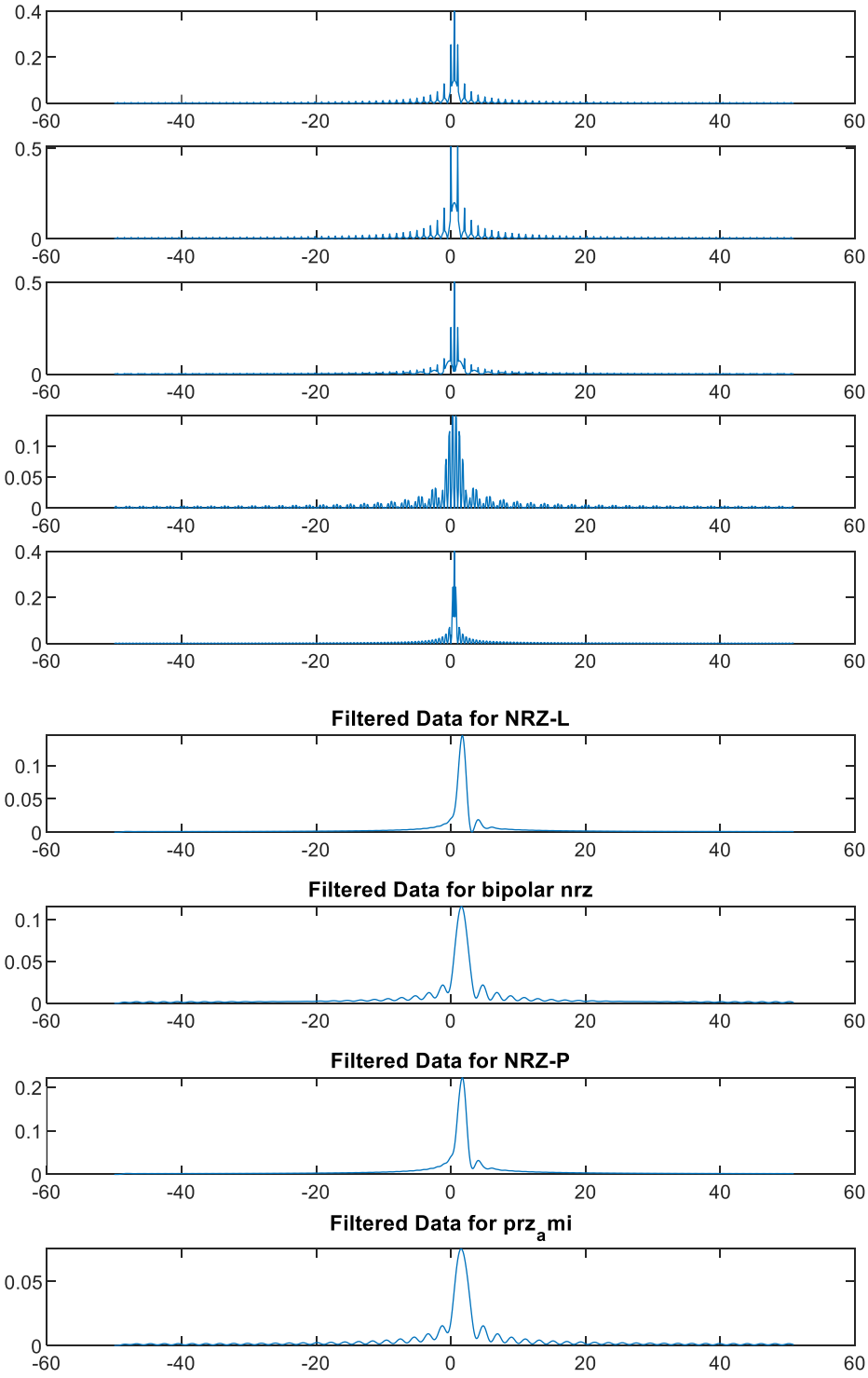
Digital Bit	Line code Voltage	Bit Rate R_b	Power At 0 Hz	First Deep Null Frequency	Power at First deep null	Essential BW / R_b
1	+1 or -1	10	0.015625	2.5	0.00169	0.25
0	0	10				

Table 5: Time & Spectral Domain Properties of line codes (NRZ-M)

Digital Bit	Line code Voltage	Bit Rate R_b	Power At 0 Hz	First Deep Null Frequency	Power at First deep null	Essential BW / R_b
1	+1 -> -1 or -1 -> +1	10	0.053	3.0	0.00291	0.3
0	No change	10				

B – Effect of Bandwidth Limiting of channels

Code in B



Observation: A low-pass filter (LPF) is a filter that passes signals with a frequency lower than a selected cut-off frequency and attenuates signals with frequencies higher than the cut-off frequency.

C – Detection of line coded signals corrupted by bandlimited channels

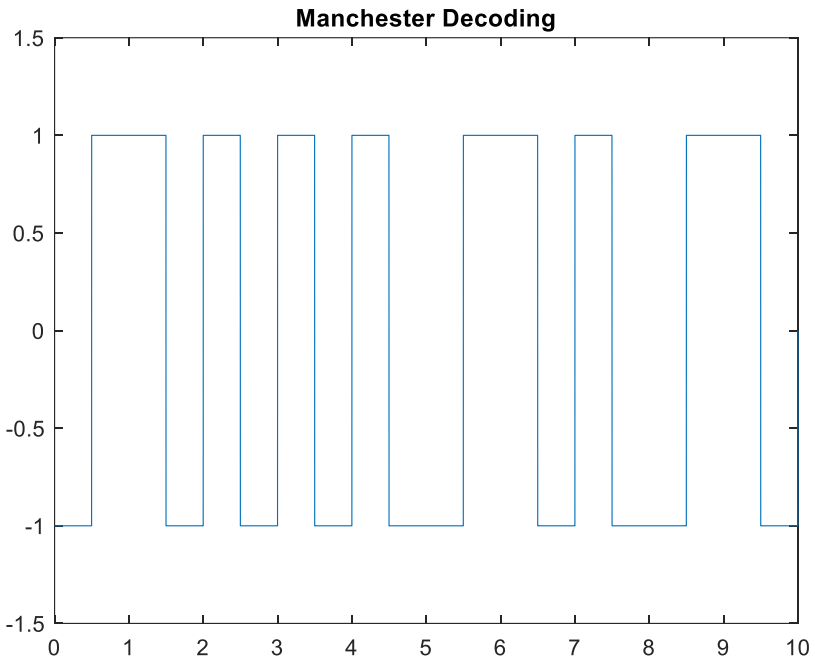
Code in C1,C2,C3

```
Manchester Decoding:
     0     1     1     1     1     0     1     1     0     1

>> bits

bits =

     0     1     1     1     1     0     1     1     0     1
```



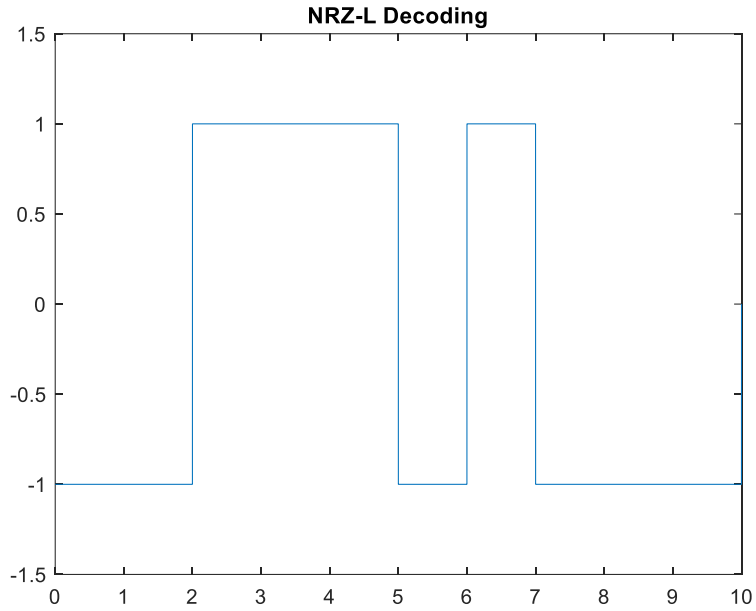
Error Rate: 0

```
NRZ-L Decoding:
     0     0     1     1     1     0     1     0     0     0

>> bits

bits =

     0     0     1     1     1     0     1     0     0     0
```



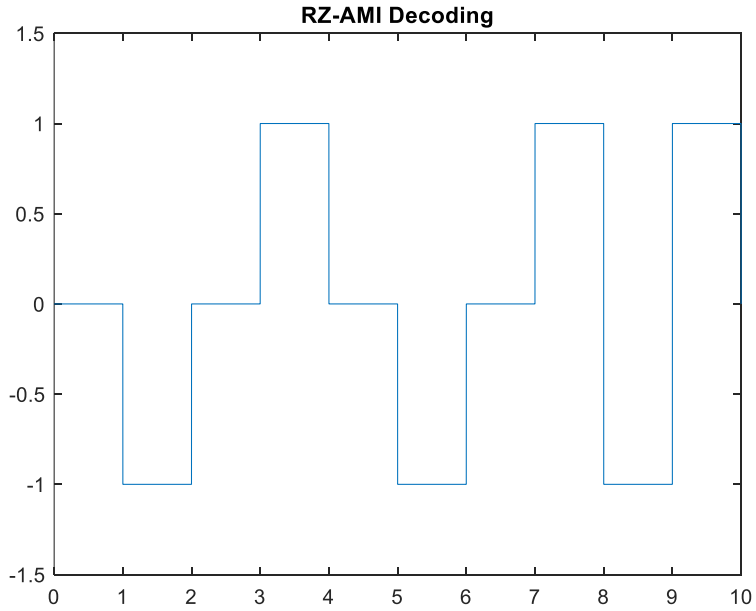
Error Rate: 0

```
AMI Decoding:
     0     1     0     1     0     1     0     1     1     1

>> bits

bits =

     0     1     0     1     0     1     0     1     1     1
```



Error Rate: 0

D – Conclusions:

List out your learnings from the experiments.
Learned various encoding schemes for digital signals, Error calculations, Effect of bandwidth limiting of channels