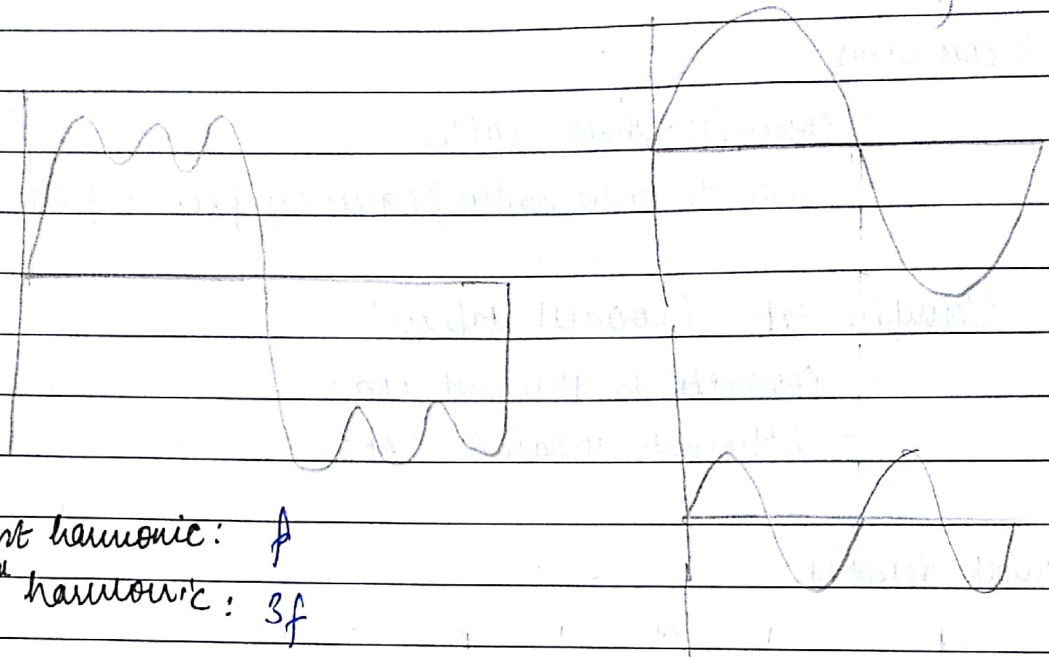- Traffic filtering
- LANs connects to LANs & WANs together
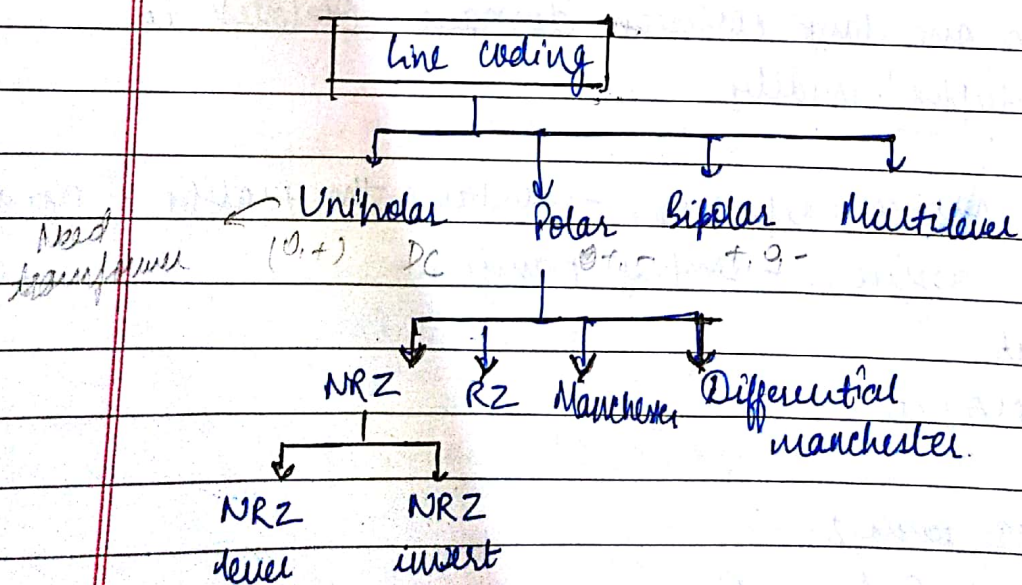- Dynamically updating routing table

First harmonic: f
3rd harmonic: $3f$

1st and 3rd harmonic : $f + 3f$
↳superposition

Coding scheme types: → to remove noise or provide error detection.
• Line coding — Bit by bit
- Block coding — Blocks by block

Line coding

Unipolar   Polar   Bipolar   Multilevel
$(0, +)$ DC $0 +, -$ $+, 0, -$

Need frequencies

NRZ   RZ   Manchester   Differential manchester.

NRZ level   NRZ invert

NR2-L: The level of voltage determines the value of bit

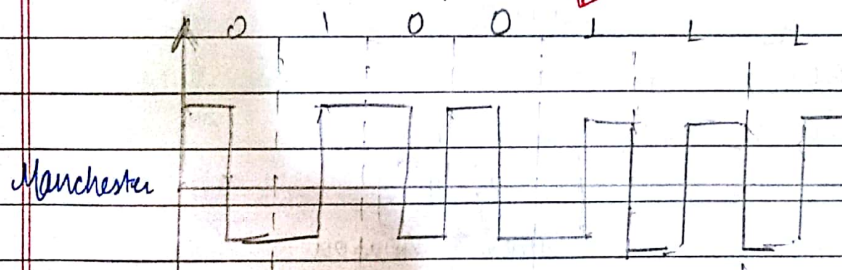NR2-I: Reversion or the lack of inversion of determines the value of bit.
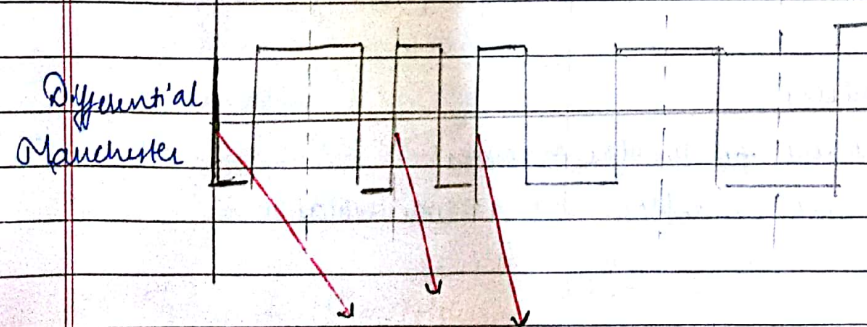
RZ encoding :-
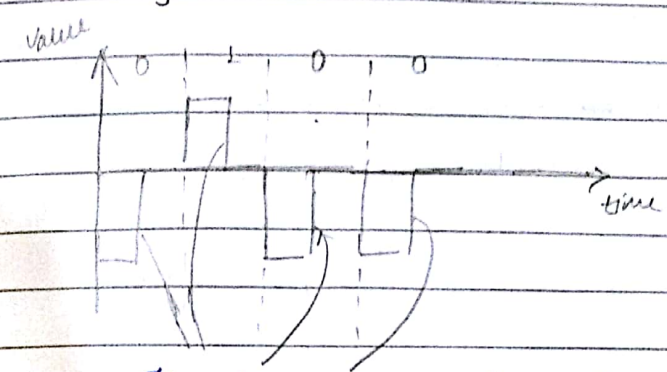
These transitions can be used for synchronization.

- Uses three values : $0, -ve, +ve$
- doesn't change b/o the bits but during.

Manchester and differential manchester

$\sqsupset \rightarrow$ zero $\sqsubset \rightarrow$ one

Manchester

Differential Manchester

$\rightarrow$ During of a bit is divided into two halves.
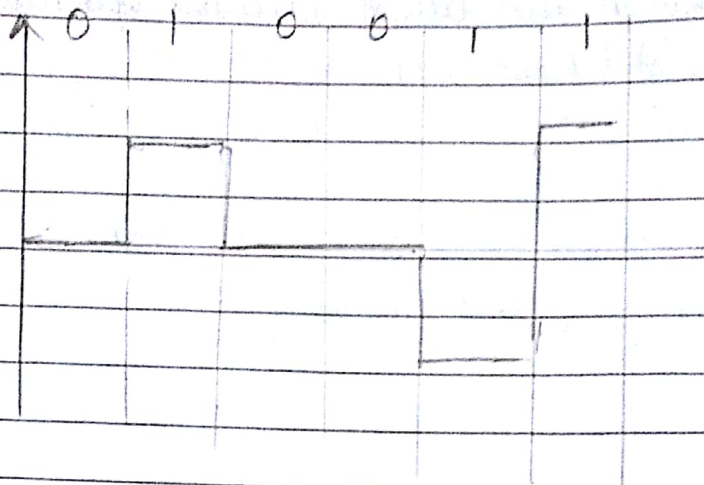
The transition at middled provides synch².

$\rightarrow$ There is always transition at the middle of the bit but value is determined is at the beginning of the bit

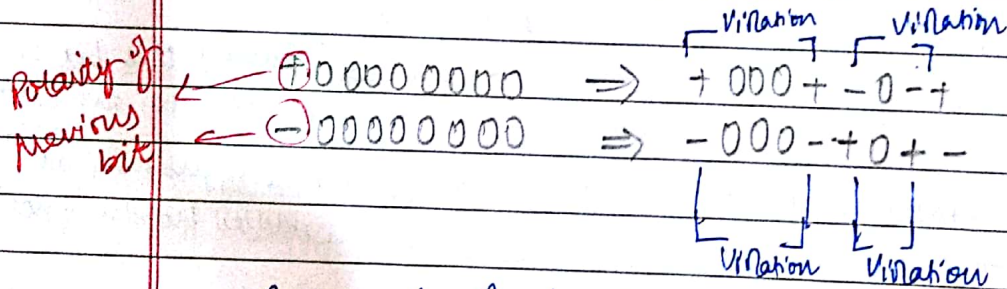Presence of transition at the beginning of the bit time means zero

Bipolar

AMI   B8ZH   HDB3
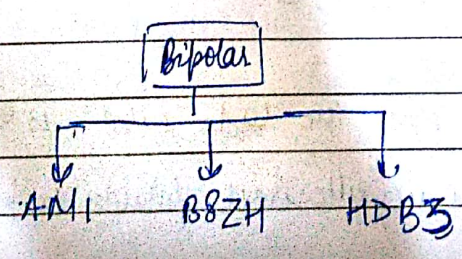
Bipolar AMI encoding

- Alternate mark Inversion
- 0 → neutral
- 1 → change from non-negative to negative or non-positive to positive.

B8ZS encoding

- Bipolar with 8-Zero substitution

Polarity of previous bit

$$(+) 0000\,0000 \Rightarrow + 000 + - 0 - +$$
$$(-) 0000\,0000 \Rightarrow - 000 - + 0 + -$$

(with "Violation" markers)

- Pattern of violation is same, just polarity changes.

HDB3 encoding

- High density bipolar 3 zeroes.
- Fourth zero is replaced with a code violation.

$$+ 0000 \Rightarrow + 000 +$$
$$- 0000 \Rightarrow - 000 -$$

If the no. of 1s since the last subst^n is odd

$$+ 0000 \Rightarrow + - 00 -$$
$$- 0000 \Rightarrow - + 00 +$$

If the no. of 1s since the last subst^n is even.

* Successive violations are alternate polarity to prevent DC component.