→ Analog Communications → 30%.

→ Digital " → 40%.

→ Noise analysis → 30%.

16/100

CSE → PROAKIS & SALEHI

ADC → SCHAUM SERIES

CS → Prof. VENKAT RAO → [NPTEL]

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LIBGEN.IS

Signals & Systems

→ FT

Random Variables

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Analog Communications

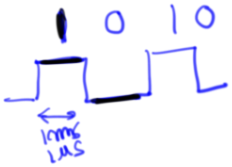
→ Transfer information from one place to another place using electrical signals

VOICE → 300 – 3.5 KHz → Telephone

AUDIO → 20 – 20 KHz → Radio

VIDEO → 0 – 4.5 MHz → TV

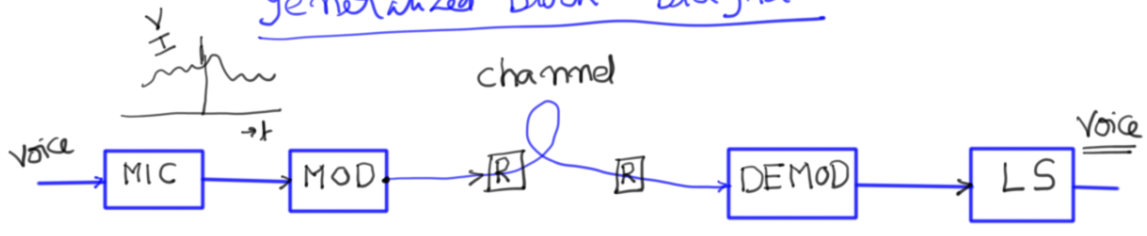
DATA → Pulse width → Internet



① SIMPLEX → only Tx or Rx Ex: Radio & TV

② DUPLEX < HALF DUPLEX
FULL DUPLEX
Phone

Generalized Block Diagram



Twisted Pair
Coaxial Cable } Wire Comm
OFC

Free Space → Wireless Comm

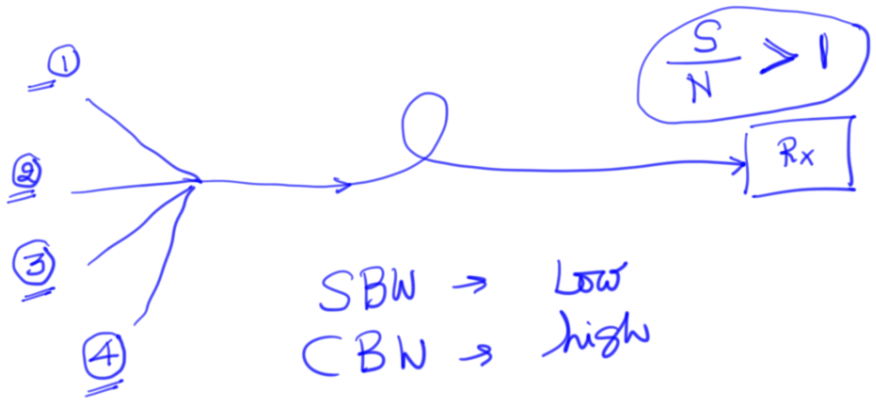
1. Distance
2. Type of Cable
3. Tx Power (or) SNR
4. Type of Modulation

100KHz

88M — 108MHz

$$\downarrow \lambda = \frac{c}{f} = \frac{3\times10^8}{300}$$

$$\lambda = \frac{3\times10^8}{800\times10^6}$$



SBW → Low

CBN → high

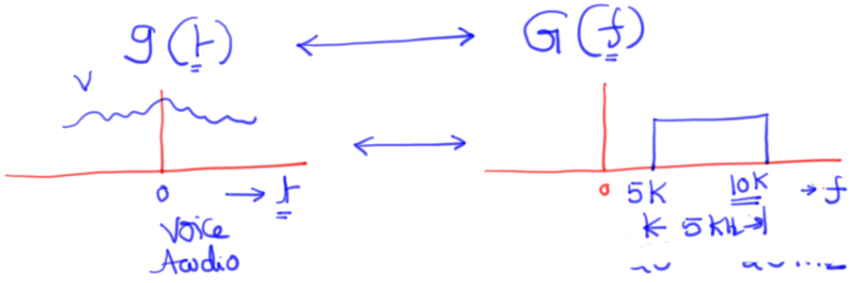
NEED FOR MODULATION

1. To reduce the physical dimensions of the antenna
2. Multiplexing of signals
3. To reduce the effect of Noise
4. For freq allocation.
5. To overcome equipment limitation
6. To convert a WB signal into a NB signal

F. T.

→ To determine the freq present in a signal
→ Convert a time domain signal into

CRO ⟷ SPECTRUM ANALYSER



BW is defined as the range of the freq occupied by the signal

$$BW = f_H - f_L$$

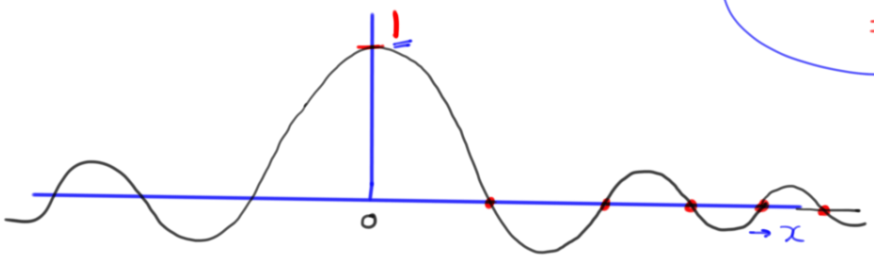
$$g(t) \longleftrightarrow G(f)$$

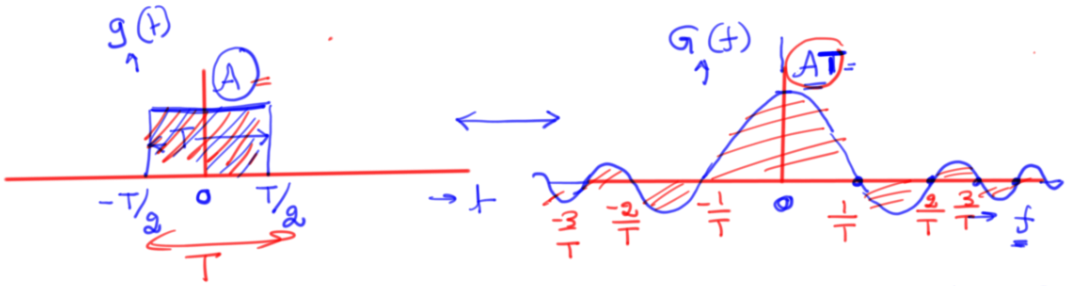
$$G(f) = \int_{-\infty}^{\infty} g(t) e^{-j2\pi ft} dt \quad - (1)$$

$$g(t) = \int_{-\infty}^{\infty} G(f) e^{j2\pi ft} df$$

$$\text{Sinc}(x) = \frac{\sin \pi x}{\pi x} = 0$$

$x = \pm 1, \pm 2, \pm 3, \pm 4, \ldots$





Value at $f = 0$ is equal to the area under $g(t)$

" $t = 0$ is " " " " " $G(f)$

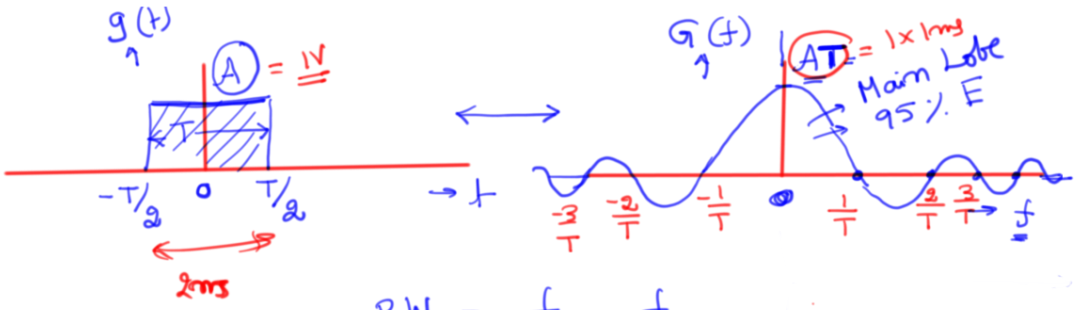
$$G(f) = \int_{-T/2}^{T/2} A\, e^{-j2\pi ft}\, dt$$

$$= AT\, \frac{\sin \pi f T}{\pi f T}$$

$$\boxed{G(f) = AT\, \mathrm{sinc}\,[fT]}$$

$$x = fT = \pm 1, \pm 2, \pm 3, \cdots$$

$$f = \pm \frac{1}{T}, \pm \frac{2}{T}, \pm \frac{3}{T} \cdots$$



$$BW = f_H - f_L$$
$$= \infty - 0$$

Dont Consider the -ve freq, while cal the BW
Practically -ve freq will not exist.

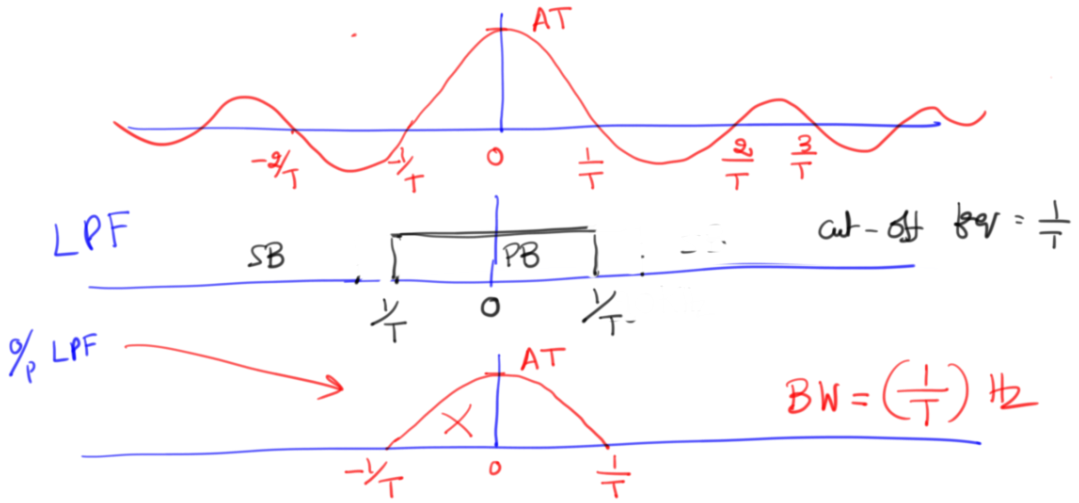
$$BW = \infty \quad [\text{Theoritical}]$$

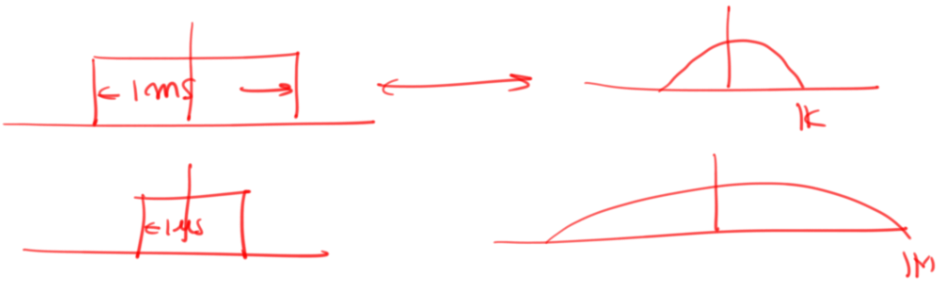
$$BW = \left(\frac{1}{T}\right) \quad [\text{Practical BW}]$$

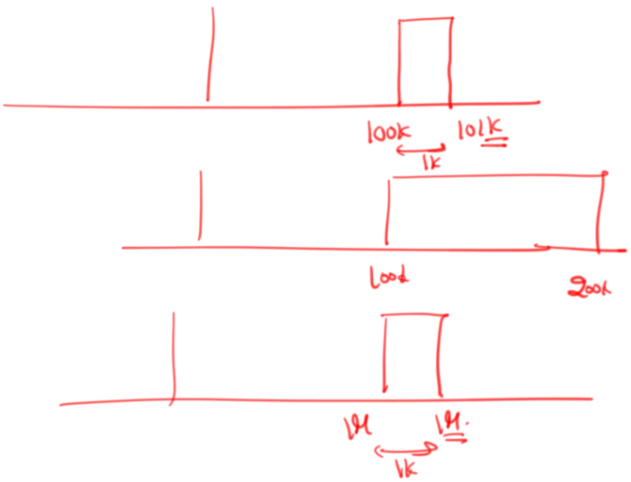
BW inversely Proportional to Pulse width

$$\frac{\sin\theta}{\theta}$$

To reduce the BW of a signal, insignificant frq are eliminated.




1ms
1μs
1K
1M


100K
101K
1K
1.00d
200K
1M
1M.
1K