Types of Modulation:

- **Modulation**
  - Continuous wave modulation (Carrier wave is continuous)
    - Amplitude Modulation (AM)
    - Angle modulation
      - Frequency modulation (FM)
      - Pulse modulation (PM)
  - Pulse modulation (Carrier wave is in the form of pulses)
    - Analog pulse modulation
      - PAM
      - PWM
      - PPM
    - Digital pulse modulation
      - PCM
      - Delta modulation

Signal Distortion in Sampling:

* In deriving sampling theorem, signal $g(t)$ is assumed to be strictly band-limited, with no frequencies higher than W.
* However, a signal cannot be finite in both time and frequency.
* To be strictly band-limited, $g(t)$ must have infinite duration for its spectrum
* Practically, finite segment of the signal is considered, for which case the spectrum cannot be strictly bandlimited.
* When a signal of finite duration is sampled, an 'error' in reconstruction occurs as a result of sampling process.
* Consider a signal $g(t)$ whose spectrum $G(f)$ decreases with increasing frequency 'f' without limit (fig a)

fig a)

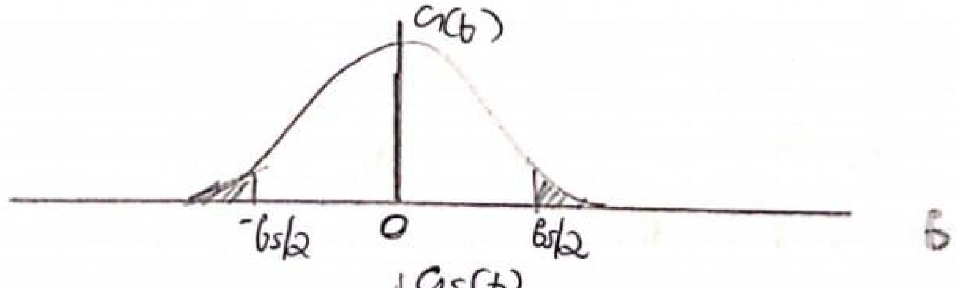
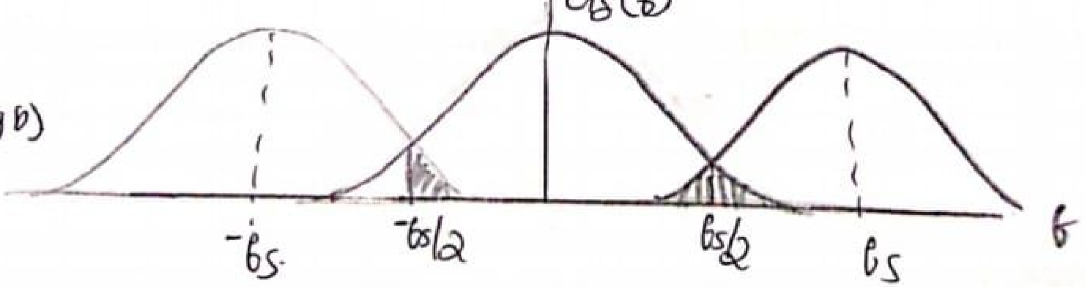


fig b)



* Spectrum $G_s(f)$ of discrete time signal $g_s(t)$, resulting from ideal sampling is shown (in fig b)

$G_s(f)$ is the sum of $G(f)$ and an infinite number of frequency-shifted replicas of it.

* Low-pass reconstruction filter is used with its passband extending from $-f_s/2$ to $f_s/2$.

* Undistorted version of original signal $g(t)$ can not be obtained; Instead, portions of frequency-shifted replicas are folded over inside the desired spectrum.

i.e, high frequencies in $G(f)$ are reflected into low frequencies in $G_s(f)$.

[observe shaded areas of spectra in fig a & b]

*** The phenomenon of a high-frequency in the spectrum of the original signal $g(t)$ seemingly taking on the identity of a lower frequency in the spectrum of the sampled signal $g(t)$ is called 'aliasing' or 'foldover'.

Due to this effect, information is inevitably lost in the sampling process.